

# MOTOR AGE

Volume XXXVII  
Number 13

PUBLISHED WEEKLY AT THE MALLERS BUILDING  
CHICAGO, MARCH 25, 1920

Twenty Cents a Copy  
Three Dollars a Year

## Mark the Prosperity of Essex Dealers

*A Few Essex Franchises Are Open—  
This May Mean Your Opportunity*

Success is assured the men who hold Essex franchises.

All know Essex merits.

All know that it holds the world's official 50-hour endurance record of 3037 miles and the world's 24-hour road mark of 1061 miles.

Essex was designed by the same men who build the Hudson Super-Six. It is made in the same factory. Into it was put all of Hudson's years of experience as the world's largest builder of fine cars. So Essex was a mature, proved car even when it first appeared.

That explains why it has the beauty, fineness and endurance of larger, costlier cars, combined with the moderate price and operating economy of other cars of its weight. That explains its everyday, dependable service, so widely praised by owners.

These are the reasons why Essex set a world's sales record in its first year. They indicate a steady, healthy growth in the future.

They mean the good will and admiration of thousands who know Essex performance — the strongest of all advertising and selling aids.

They mean that everywhere are prospects who are already half sold. Salesmen have no resistance to break down in selling the Essex. Just a ride sells it.

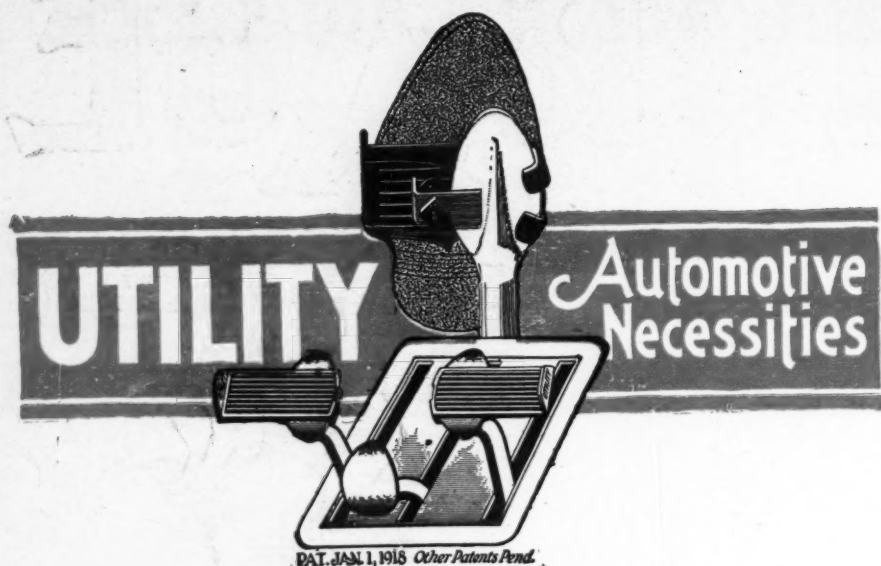
There are a few Essex franchises open now. There may be one in your territory.

Do you measure up to the standard of Essex dealers? If so you can join them in the prosperity that must accompany Essex growth. And the chance to handle Hudson Super-Six may result from your Essex connection.

Write or wire for information.



E-50



## UTILITY Pedals *for* Fords

THE owner who first said of UTILITY Pedals, "they are the absolutely necessary accessories for Fords" voiced the key-note of their success.

The safety and comfort UTILITY Pedals afford drivers of Ford cars insure sales, that in actual practice have grown bigger and bigger every season.

All jobbers know UTILITY Pedals for Fords. Most jobbers stock and catalog them.

*Dealers:* That is the way they have of recommending them to you. Order from your jobber now.

*Jobbers:* Get in touch with us.

**Price Per Set, \$1.25**

### HILL PUMP VALVE COMPANY

Mfrs. of UTILITY Protected Heaters, UTILITY Pedals for Fords, UTILITY Pumps, UTILITY Universal Rim Wrenches and UTILITY Universal Wrenches.

Archer Avenue and Canal Street

CHICAGO

SALES DEPARTMENT

THE ZINKE CO.

1323 S. Michigan Avenue, Chicago



# MOTOR AGE

Published Every Thursday by  
**THE CLASS JOURNAL COMPANY**

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Vol. XXXVII

Chicago, March 25, 1920

No. 13

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## MOTOR AGE

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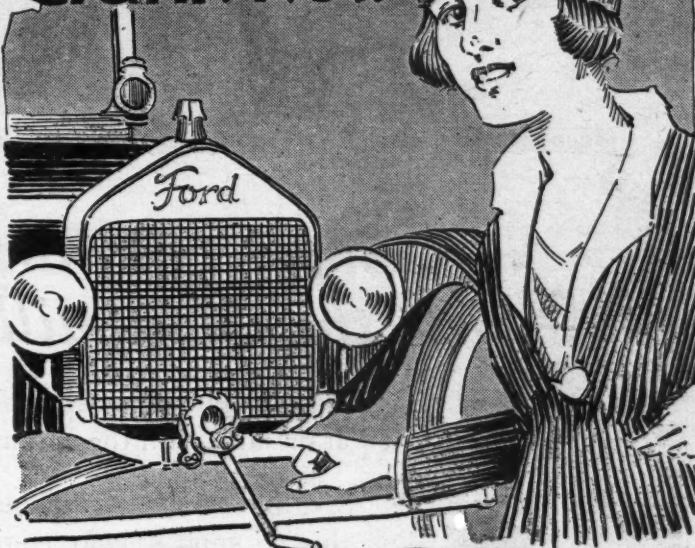
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"My Ford  
Is Safe to  
Crank Now"



## ATLASTA SAFETY AUTO DEVICE

Tens of thousands of Ford owners—men and women—will gladly welcome the introduction of this simple, strong, dependable safety device that eliminates chances of broken arms and wrists.

Here's a wonderful opportunity for you to make extra, easy and profitable sales to your Ford customers. It also gives you a chance to get acquainted with Ford owners who are not customers—and this will assuredly lead to more business. Every owner of a

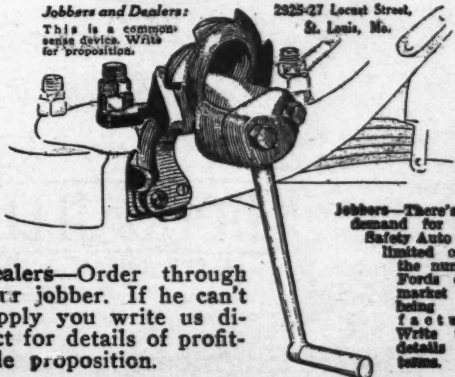
### Ford Car or Ford Truck \$2.50 Prepaid

is a real sales prospect. Tell them that it can be put on in 10 minutes with only a monkey wrench. Tell them it disengages the crank from the drive shaft whenever the engine backfires. This now overcomes one of the main objections to Ford driving by women.

### ATLASTA SPECIALTY MFG. CO.

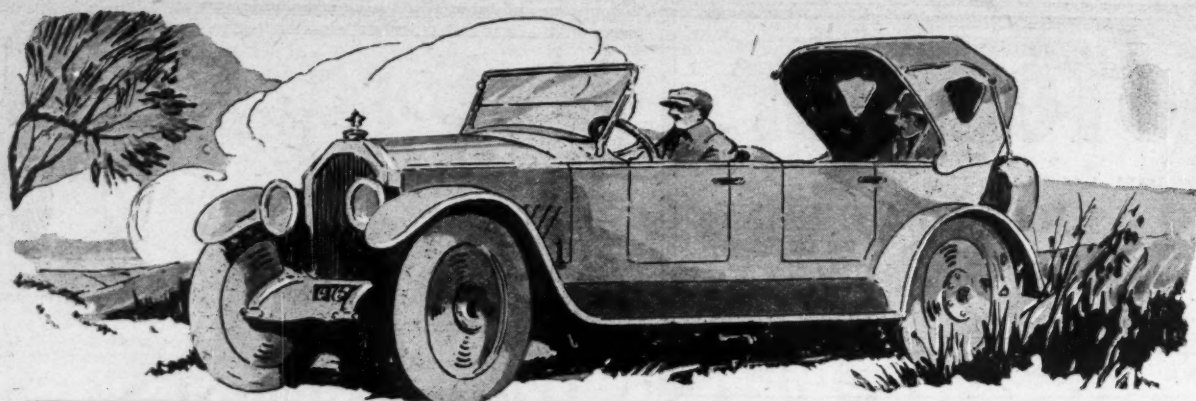
Jobbers and Dealers:  
This is a common  
sense device. Write  
for proposition.

2325-27 Locust Street,  
St. Louis, Mo.



Dealers—Order through  
your jobber. If he can't  
supply you write us di-  
rect for details of profit-  
able proposition.

Jobbers—There's a real  
demand for Atlasta  
Safety Auto Device,  
limited only by  
the number of  
Fords on the  
market and  
being man-  
ufactured.  
Write us for  
details and  
terms.

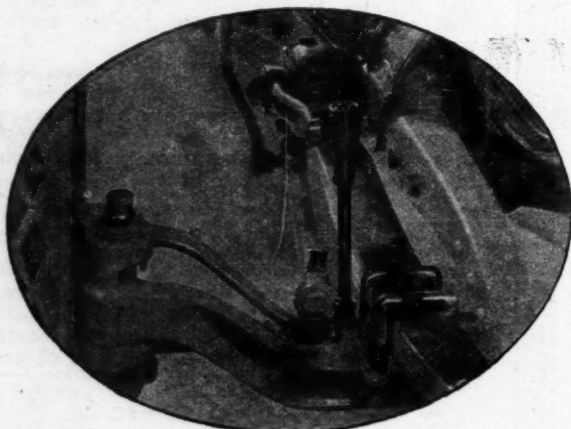


## ***Solid comfort for your car —with the Houdaille Shock Absorber***

Over rough roads or bumpy streets the car with the Houdaille shock absorber glides without jolt or jar—with the maximum of efficiency in comfort and safety.

During the war this instrument was used on the trusty French guns and ambulances. And this triumph of war engineering is today a motoring sensation.

Houdaille is superior because—it absorbs 75% of all shocks and spring vibrations; prevents body sway and broken springs; is frictionless (having only one moving part); has no straps to break nor springs to lose tension, and will not rust, squeak nor freeze; is made of the finest steel and each instrument weighs only 7½ lbs.



*Photo showing part of Panhard-Levassor chassis — Houdaille standard equipped.*

The Cunningham has adopted Houdaille as standard equipment. And the famous foreign motor cars—Alba, Alda (F. Charron), DeLaunay, Belleville, Farnam, Panhard & Levassor, Minerva, Piccard & Pictet, Peugeot, Renault, Rochet-Schneider, Secqueville and Hoyau, Unic (Q. Richard) are also equipped with Houdaille.

*There must be a reason—let us tell you about it.*

**Certain desirable territory still open to the right dealers**



**Houde Engineering Corp. 1396 West Ave., Buffalo, N. Y.**





# The Publisher's Service Station

*Rendering Service to Help You Render Service*



## INSURANCE AND OTHER THINGS

While discussing the upward trend of things with our insurance man the other day we learned that in spite of advancing costs in practically all lines, it would not cost us any more to take out additional insurance now than it did a year ago.

"Well, there's some satisfaction in knowing that," said we. "Yes," said the insurance agent, "there are two things that have not kept pace with the advancing prices of most commodities: one is our line of insurance and the other is yours."

"The other is yours." Those words made us think a moment, but before we had time to fully digest their meaning our friend stated that you could still invest in a subscription to MOTOR AGE at the same rate that was in effect five years back.

Of course we knew this without his telling us but it was never put to us that way before and we wonder whether all of our friends and readers realize that MOTOR AGE is still offering them a special kind of business insurance at the same old fee of \$3.00 a year via subscription?

Speaking of insurance, there is another grade of insurance that often pays well. It's in the form of labor-saving machinery. Like other kinds of insurance, it isn't a question of whether we can afford it, but rather a question of decision—action. The lead story in this number of MOTOR AGE contains some good pointers

### About Labor Saving Machinery

You hear a lot these days about efficient methods and speeding up production in our factories and business houses generally. What applies to factories and business houses applies equally well to the dealer's service station. The dealer must make sure that he is tooled up as well as he should be in order to render the right kind of service and keep the good will of his customers. Labor saving machinery is one of the greatest assets when it comes to building up and retaining good will, but the question that usually confronts us these days when we buy anything is: "Can I afford it?"

That, by the way, happens to be the title of the lead story in this week's issue. After you read the story we feel sure you will agree with us that you will change this question to "I must afford it," provided you are contemplating the purchase of machinery or equipment for the service station.

And—you are going to get more information regarding the feasibility of installing labor-saving machinery in next week's issue—the Summer Service Number—in a three-page story entitled "Tooling Up For the Spring Drive." There still are a lot of shops working with the idea that the good old-fashioned ways of doing work are the best and that most of the equipment designed to speed up repair work are nothing but some new fangled ideas. But, we must not forget that a good foreman, correct house policy and good equipment are the three big factors in getting by with service and repair work.

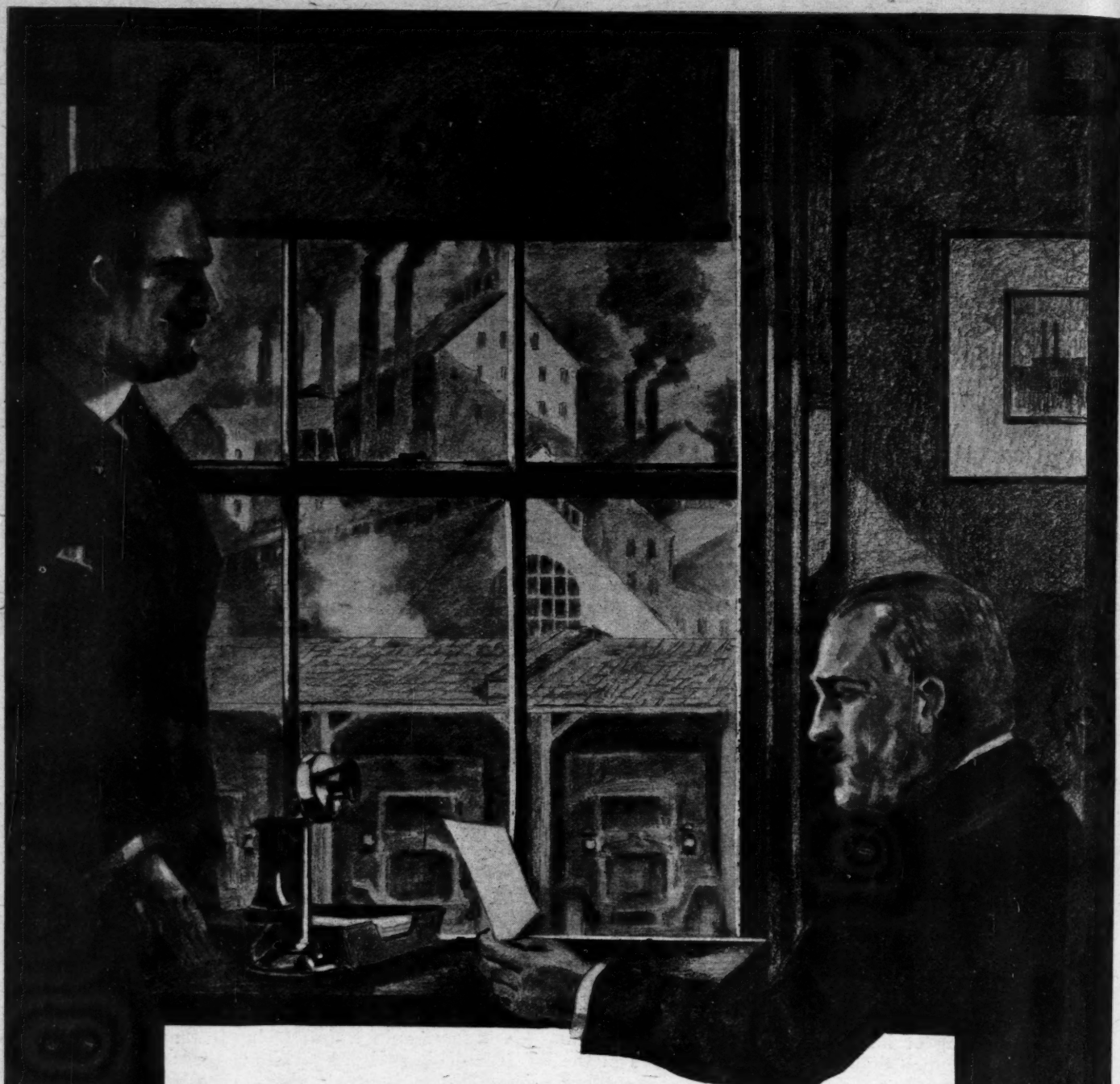
### Where Is the Cheese Factory?

Our readers would hardly expect the above to be the title of another story in the Summer Service Number but it's a fact. You probably will have quite a time trying to figure out what it is all about, but let it suffice for the time being to tell you that it simply concerns a little matter that every dealer might take up and add to his present income. Watch for this story.

### The Oats in the Carbureter

Perhaps you will wonder what in the world oats have to do with carbureters. Certainly, oats and gasoline do not make a very good mixture for the bowl of a carbureter, but do you know that there actually have been cases where service men have had to separate the solids from the liquids in a carbureter? Sure thing, and the above heading is the title of another story in the Summer Service Number. It tells what sort of equipment you should have when you are called out to untangle similar mysterious cases of trouble. The story is especially valuable to those already servicing tractors and those about to take them on. Watch for "The Oats in the Carbureter" next week.



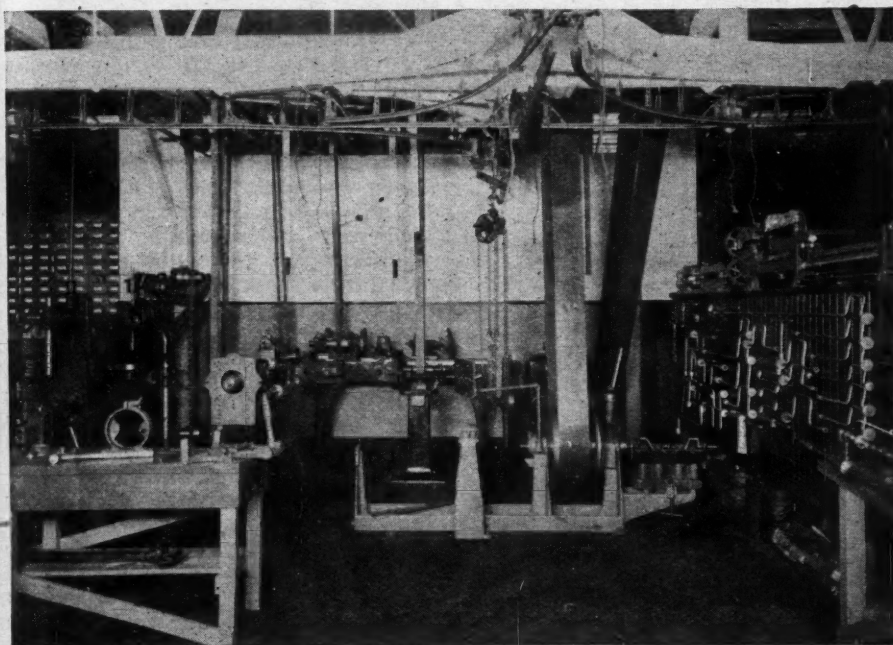


**THE TRANSPORTATION EXECUTIVE APPRECIATES  
THE VALUE OF  
AHLBERG REGROUND BEARINGS AND SERVICE**

*Investigate Our Proposition Yourself*

**AHLBERG BEARING COMPANY**  
317-327 E. 29th Street, Chicago, Illinois

# MOTOR AGE



## Can I Afford It?

Time and Labor-Saving Equipment Will  
Return Its Original Cost in Added Business and Efficiency in the Repair Shop

BY B. M. IKERT

**A**BOUT the first thought that enters our minds when we are about to buy anything of importance is: "Can I afford it?"

So it is quite natural to hear this from the lips of the automobile dealer, especially running but a small shop, when confronted with the problem of fitting out his shop with labor-saving devices. Before answering the question let us go on a little further and see what is required of the present day repair shop.

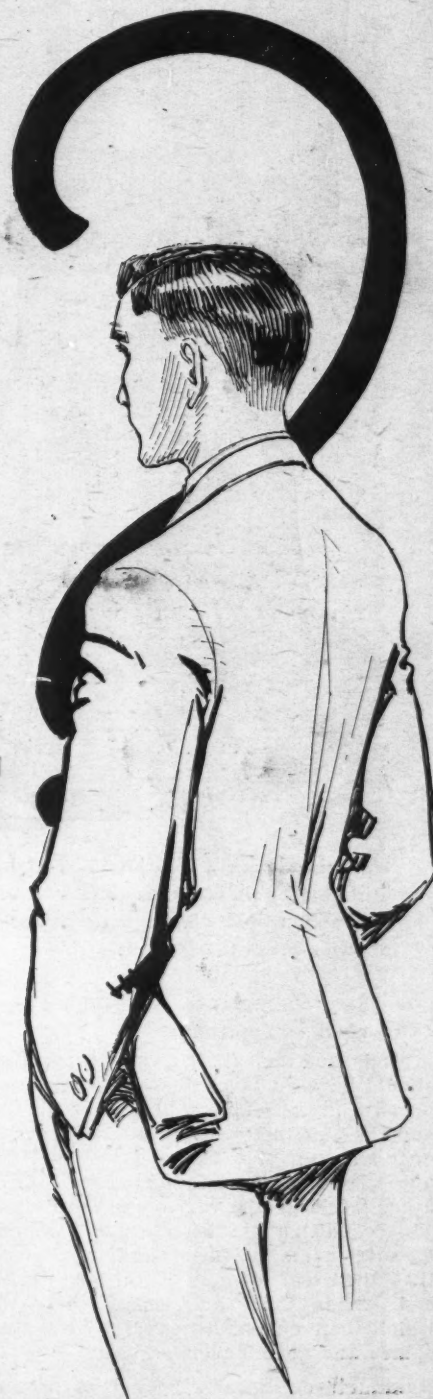
In the first place, the ser-



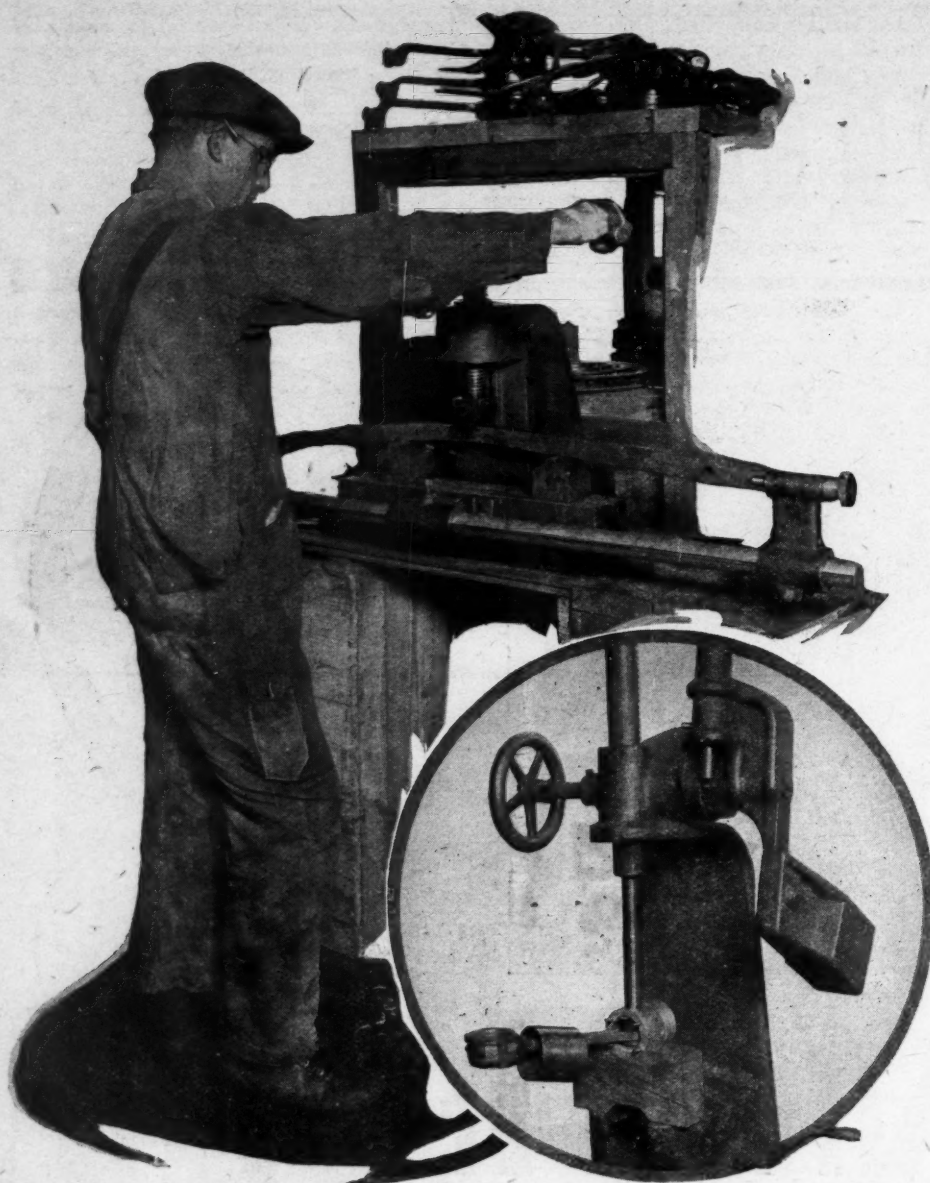
A piston aligner saves time and insures accuracy

vicing or repairing of motor cars, trucks and tractors is a business, the same as the manufacture of such vehicles. And, the dealer who tools up his shop properly, in other words, installs labor saving equipment to put his service work on a production basis is the one who is going to cash in on his customers and get the proper backing from the manufacturer of the goods he represents.

Manufacturers of automotive apparatus are insisting more and more that their service stations install labor-saving equipment. Mechanical clinics are being held from time to time by various concerns to show dealers and service men the value of time-saving machinery. As time goes on every repair shop will find it necessary to put in more labor-saving machinery to hold customers and to get the recognition of manu-







Here is shown a mechanic straightening a front axle by means of a press. Ordinarily this would require two men, a forge, anvil, sledges, etc., and the job probably would not be done as well as with the press. In the circle is shown another press forcing out a piston pin. This is superior to a drift and hammer

facturers. To quote from a manufacturer of shop equipment:

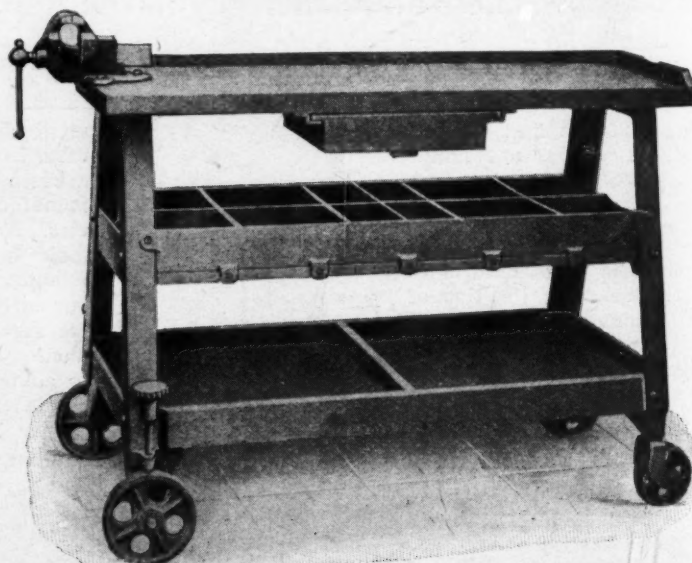
"It is not logical that a manufacturer should have an investment of millions of dollars in a plant equipped with the very best of labor-saving devices to produce an automobile and to have the same automobile repaired by a man with only a hammer and screwdriver to work with. This condition has been brought to the manufacturers' attention and they know that their car owners cannot be satisfied unless there are repair shops to which their customers can take the machines and get efficient service.

#### Manufacturer Speaks

"So the natural result is that manufacturers are requesting owners to take cars to designated service stations and the manufacturer is requiring his service stations to put in equipment that will enable them to give efficient service."

If every dealer analyzes his territory and studies the potential trade, it is

A portable repair bench like this one saves much time in that the mechanic does not have to go back and forth to the stationary bench. There are compartments for holding parts as they are removed. Note the brake on the wheel, which makes it possible to anchor the bench



worth his while to look seriously into the matter of labor-saving equipment. He may be short of help, he may have poor help, or he may think things are going on all right as it is, but with the ever-increasing production and use of automotive vehicles it does not take a great deal of imagination to see that in the years to come repair shops and service stations are going to be called upon to do more and more work. And, instead of more shops might we not get more out of our present shops by correct installation of equipment?

The shops that gradually is adding more and more to its equipment now will be the one sought later on. We like to go to a large hotel, not just because it is large, but because it has the many little conveniences we like. Car owners are human and they seek the service station where their wants are attended to intelligently and efficiently. One contributing factor to this is good equipment in the shop.

#### Business to Wide-Awake Man

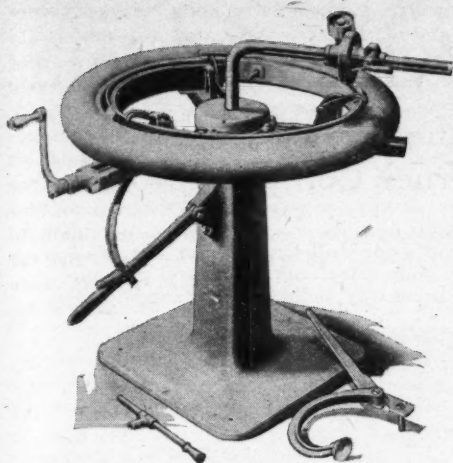
The days of the hammer and screwdriver service station are numbered. Such concerns will either be forced to install modern methods and apparatus or see their business gradually slip away to the wide-awake dealer.

Shop mechanics represent just so many hours of time a day and no dealer can stretch any part of this time to cover a certain amount of work. But, he can control the work. He can get more work from his men in a given amount of time, without working them any harder.

It's just a matter of labor saving equipment, or apparatus that conserves the energy of the men. Hard work, uncomfortable positions and poor tools make men tired and tired men certainly cannot be expected to turn out good work.

Special equipment does not mean necessarily that the dealer must buy every so-called labor-saving device on the market. There are of course, devices to be had that sort of fill a universal want in every shop, big or little,





A tire changer as pictured above allows the work to be done much more quickly and looks more business-like in a service station

but every dealer should find out the nature of the most frequent repairs and then see if there is not something he can do to lessen the time required for those repairs and make them better.

He might make some of the equipment in his own shop, but as a general thing the apparatus afforded by the market to-day has carefully been designed by the makers and is superior to home-made equipment.

#### Equipment Helps Set Record

Many readers will recall the exhibit staged at the various automobile shows this year by Nordyke & Marmon, in which one of their engines was torn down and rebuilt in something like 1½ hours. The design of the engine and skill of the men made this possible to be sure, but there is no denying that the

labor-saving equipment the men used played a major part.

For instance, the job could not possibly have been done as quickly without the engine stand on which the engine was mounted. Nor could it have been done without the special wrenches, etc. The whole job was simply a combination of good design and construction, skilled men and good equipment.

#### Equipment Pays Dividends

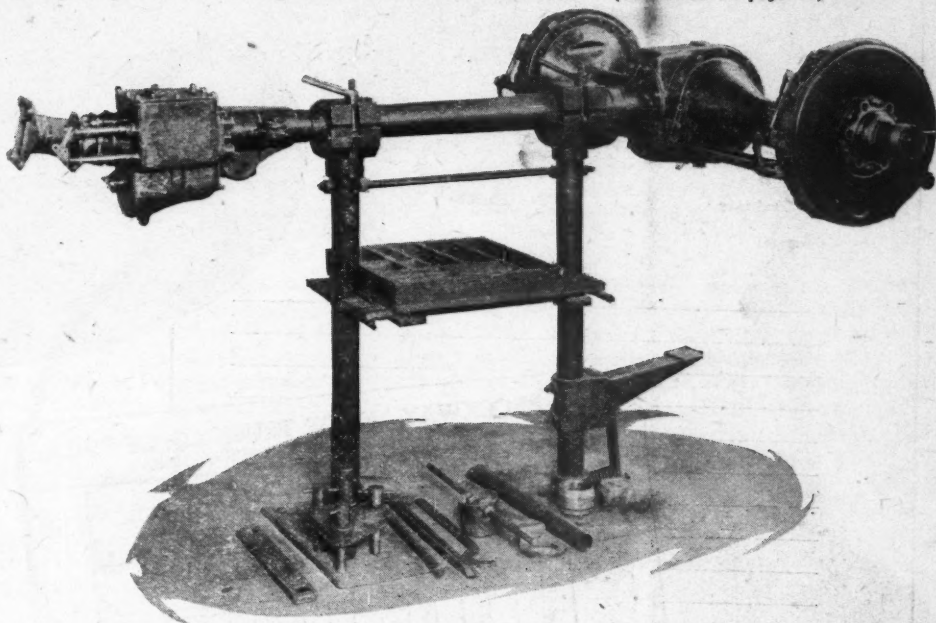
The right kind of labor-saving equipment is an investment, an investment that pays big dividends. No repair shop, therefore, can feel that it cannot afford are pretty well tooled up when it comes

equipment. It is essential to good business and an investment on which money will be made.

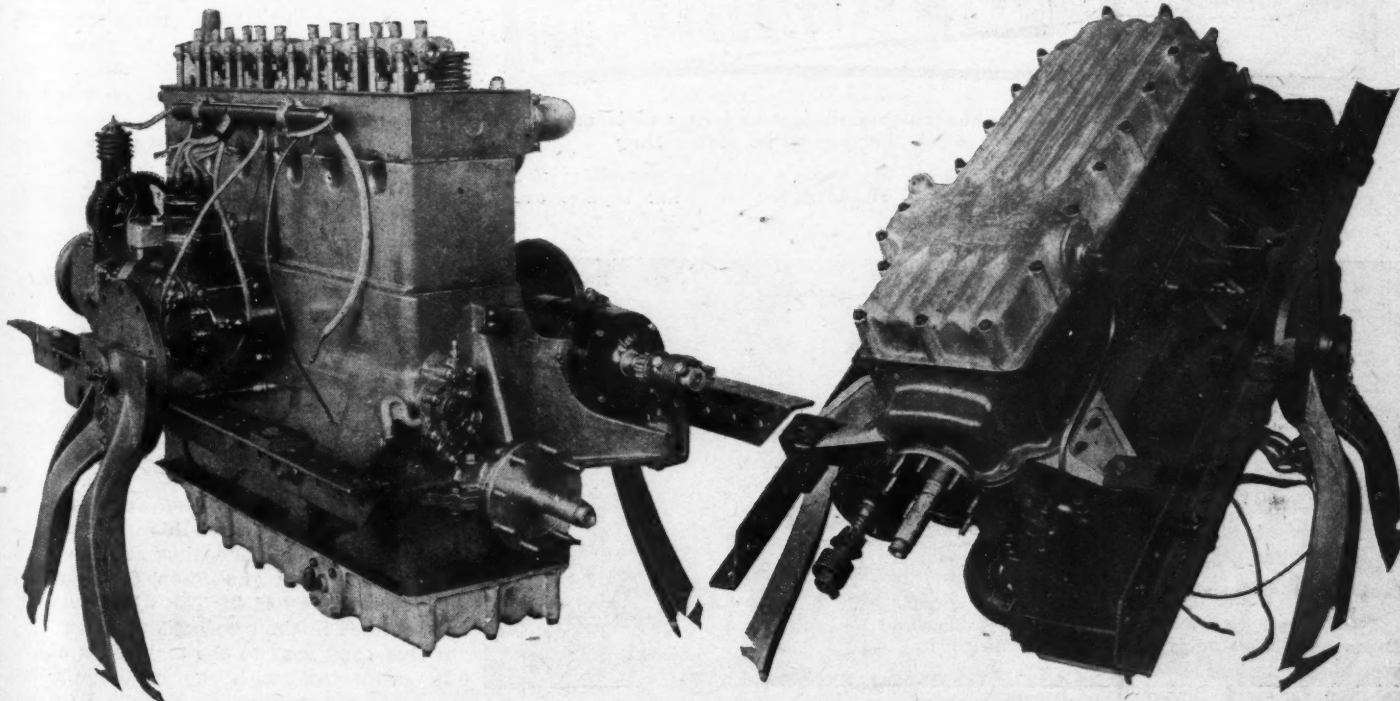
The "Can I Afford It?" attitude must be changed to "I Must Afford It." The dealer who spends several hundred dollars or more on labor-saving equipment is in position to grasp all the potential repair work in his territory.

It is almost certain that every dealer can afford labor-saving equipment of some kind. Even if he only replaces a monkey wrench with a set of speed wrenches he has taken a step in the right direction. However, most shops

(Continued on page 32)




What applies to engine stands applies equally well to rear axle stands. Good axle work is impossible when the axle lies on the floor or is in some other inaccessible position



The engine of a car, truck, or tractor gets probably the greatest amount of service work and in order to handle it to the best advantage an engine stand is almost a necessity. Notice how this Marmon engine has been made accessible by use of an engine stand. At the right the engine has been rotated so that the bottom of the crankcase can be easily reached. Engine stands conserve mechanics' energy

# Where "Minute Man" Service Obtains

Thorough System is the Watchword in the Service  
Department of the Brockway Motor Truck Co.



**BROCKWAY MOTOR TRUCK CO.**  
OF PHILADELPHIA  
2324-26-28 MARKET STREET

Date \_\_\_\_\_ Date Promised \_\_\_\_\_ Shop No. \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

Car No. \_\_\_\_\_

Order received by \_\_\_\_\_ Work ordered by \_\_\_\_\_

Charge to \_\_\_\_\_

**INSTRUCTIONS**

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**BROCKWAY MOTOR TRUCK CO. OF PHILA.**  
2330 MARKET STREET, PHILADELPHIA

No. 425

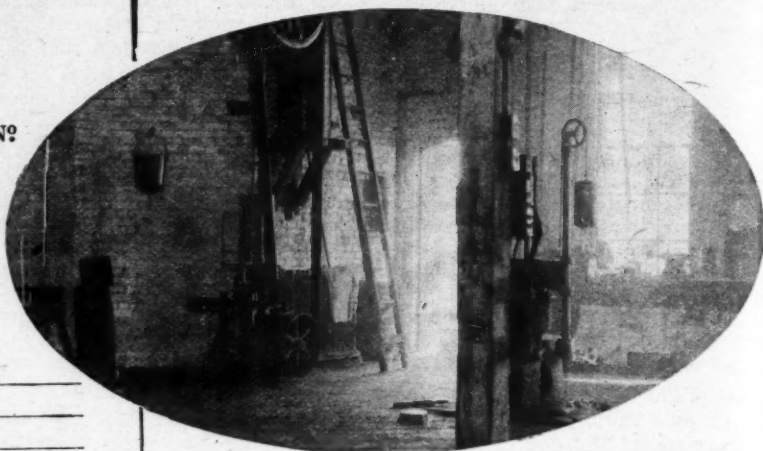
MOTOR SPECIALS		Name
Oil Strainer		Address
Con. Rod Cutters		Truck No.
Pinion Pin Cutters		Reg. No.
Main Bear Cutters		Job No.
Clean Oil		
Water in Rad.		
Oil Leaks		
Oil Pump		
Water in Rad.		
Oil Leaks		
Oil Pump		

Job Time Card No. \_\_\_\_\_

Date Arrived \_\_\_\_\_ Date Finished \_\_\_\_\_

Inspected by \_\_\_\_\_

View of air compressor drill, on extreme left; wall work bench and shop telephone on central post on fourth floor of Brockway building, in Philadelphia



BY K. HERRICK

INCREASING demands through a growing trade have evolved a service system at the Brockway Motor Truck Co., Philadelphia, in which it has been found expedient to originate business forms to facilitate transactions not only between the company and the customer, but also between the company and the factory. Close contact between sales and service station and factory, whether branch, or parent plant, has been proved the surest and swiftest means of cementing trade.

Fifteen service forms are used and in assembling these forms, for convenience of review they may be divided into two classes, as follows:

(1) Forms for straight procedure of routine.

(2) Forms used in special cases.

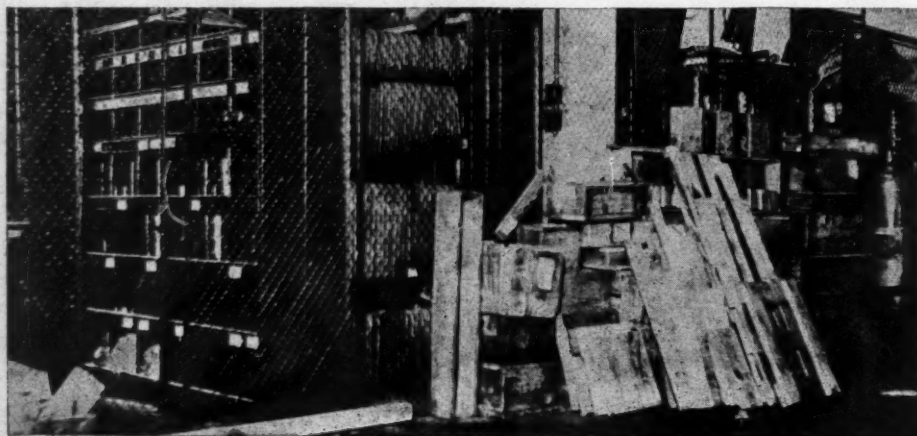
There are ten in the first class and five in the second.

## Customer Met By Service Manager

In the case of routine, considering the principal purpose of the service station to be making repairs and adjustments, when a customer enters with his car, he is taken in charge by the service manager, if the job is to be one for the shop. As the customer gives his instructions on what is to be done, they are filled out in duplicate on the Shop Order form, which is 8½ by 11 in. The white original is retained in the service department and a blue copy sent to the manager's office. In connection with the customer's instructions appearing on the Shop Order, a blue Inspection Tag, 4 by 7 in., which is numbered serially, is used, and contains a list of the truck's principal members or units to be fixed.

**Shop Order Form**—This contains the customer's instructions and is made out in duplicate. It is used for a job that has to go to the shop

**Blue Inspection Tag**—It contains a list of the truck's principal members and engine specials, which are to be checked off according to what repairs are to be made



Glimpse of the Brockway stockroom in Philadelphia. Here are 2000 pressed steel, green-enameled, unit construction bins for the reception of small parts, all protected behind a steel wire enclosure running from floor to ceiling. Many parts are kept here not found in other service stations, such, for instance, as oversize pistons, piston pins and piston rings



A Car Delivery Record, or "check-in and check-out" form 8½ by 11 in. is used to record all movements of trucks in and out of the service station. This form is used also for cars ordered from the main factory. As used in connection with customer's service, as soon as the customer has issued his instructions for the Shop Order form, the Car Delivery Record is filled out and checked up to correspond with equipment on the customer's car.

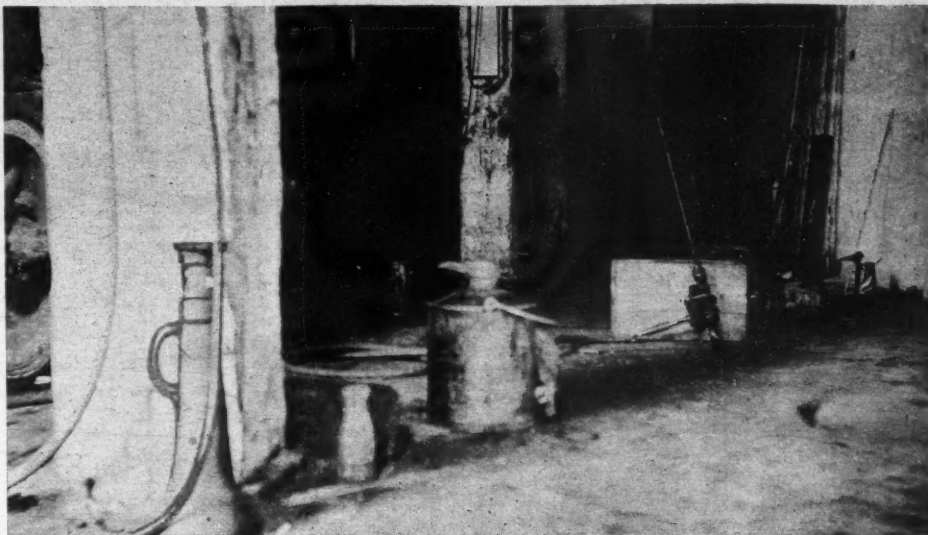
#### Equipment Carefully Checked

The checking of the equipment on this form is for the protection of both customer and service station, members even down to the oil can being listed. On a new car from the factory, the checking of this form begins when the vehicle arrives at the freight station and is unloaded. Later, should the car be sent out on a road test from the service station, it will be rechecked in the same manner. Should the truck obtain a new body, the same rechecking process is gone through with.

A form of duplicate, one white and one brown copy, 6¼ by 9½ in. is virtually self-explanatory through its name, Parts Used on Shop Order. This is made up from the various requisitions on the stockroom, issued for the job.

The Stockroom Orders, or Mechanics' Requisitions, are white slips, 3¼ by 5 in. They have six ruled lines for entry of stock ordered, job number, and signature of the head of the department.

The Job Time Card is a red card, 4¼ by 9¼ in. When a mechanic starts on his work, he rings in on this card and



Corner of garage where some heavy duty work is done. Note air drill against box. This company has a firm belief that every well equipped service department should have air drill facilities

also on his Weekly Time Card, a manila form of about the same size, which contains his time record for the week and which must correspond with the Job Time Card record, tallying with the clock. When assigned by his foreman from one job to another, he "rings over."

#### Comprehensive Time Card

The Job Time Card contains, in addition to the "on" and "off" punched entries of the time recorder, the following: Mechanic's name, date, Repair Order

number, list of all operations; "hand" number; elapsed time; total labor and labor charged to customer. Where there is policy work, of course the labor is not charged to the customer for those particular items. All of this is under "Operations." On the reverse side of the Job Time Card are spaces for the following entries: Name, address, repair order number; model; engine number and date; and on the same side, under "Parts Used," spaces appear for entries for "parts exchanged; retail price; out-

**BROCKWAY MOTOR TRUCK CO. OF PHILADELPHIA**  
CAR DELIVERY RECORD  
PHILADELPHIA, PA.

Chassis No. \_\_\_\_\_ Cab Top Curtains \_\_\_\_\_  
Cab \_\_\_\_\_ Tail Lamp \_\_\_\_\_  
Side Lamps \_\_\_\_\_ Wheel Wrenches \_\_\_\_\_  
Tools \_\_\_\_\_ Oil Can \_\_\_\_\_  
Jack \_\_\_\_\_  
Switch Key \_\_\_\_\_  
Presto Equipment \_\_\_\_\_  
Body \_\_\_\_\_  
Special Equipment \_\_\_\_\_

Tires \_\_\_\_\_ Tires Make \_\_\_\_\_  
Gear Color \_\_\_\_\_ Cab or Body Color \_\_\_\_\_  
Wheels Color \_\_\_\_\_

From \_\_\_\_\_  
By \_\_\_\_\_  
To \_\_\_\_\_  
By \_\_\_\_\_

**BROCKWAY MOTOR TRUCK CO. OF PHILADELPHIA**  
PARTS USED ON SHOP ORDER  
Name \_\_\_\_\_ Date \_\_\_\_\_  
S. O. No. \_\_\_\_\_  
Transferred \_\_\_\_\_

**BROCKWAY MOTOR TRUCK CO. OF PHILADELPHIA**  
WEEKLY TIME CARD  
No. \_\_\_\_\_ DATE \_\_\_\_\_  
NAME \_\_\_\_\_

		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Morn	In							
	Out							
Noon	In							
	Out							
Night	In							
	Out							
Extra	In							
	Out							

TOTAL TIME \_\_\_\_\_  
RATE \_\_\_\_\_  
AMOUNT \_\_\_\_\_

**Job Time Card**  
—Applies against shop order, for the mechanic

Car Delivery Record—Used in checking trucks "in" and "out" and containing list of customer's equipment, which is checked off

Parts Used on Shop Order Form—This is made out in duplicate. Requisitions are tabulated here Below—Stockroom order, or requisition

Weekly Time Card—"Rung in" by mechanic when his job time card is punched



The image shows several overlapping forms from the Brockway Motor Truck Co. of Philadelphia. The top form is a 'REPAIR ORDER—CUSTOMERS' with fields for Owner, Address, City, Captain's Order No., Date Presented, and a section for INSTRUCTIONS. Below this is a 'PARTS-SUPPLIED' and 'LABOR' section with columns for Part No., Cost, and Hours. To the right is a 'PART SALES' form with fields for Name, Address, and a large grid for recording parts. In the center is a 'Parts Card' with columns for Part No., Description, Price, and Balance. At the bottom right is a 'Part Sales Slip' with a grid for recording parts and a section for 'INVOICE'.

**Customer's Repair Order**—This sheet is made up daily from the time cards, requisitions and parts used on shop order, account being closely kept of parts, labor and time

side repairs (meaning repairs not done on the premises); hours of labor and totals."

From the Time Cards, the Requisitions or Stockroom Orders and the Parts Used on Shop Order the Customer's Repair Order is made up, the clerk in charge making the tabulations daily. This is a white sheet 11 by 14 in. When the order is being made out, the instructions from the customer are repeated under a special heading, as they appear on the Shop Order. When this form is made up from the other forms mentioned, cost and resale price are carried out for three decimals for the sake of accuracy, and to ascertain percentages. This point is insisted on, on the principle that "accounts worth keeping are worth keeping accurately."

#### Over-Charging Eliminated

A close record of parts charged in and out is kept on a yellow form 5 by 8 in., known as a Parts Card. This is reversible, either side being used for similar entries.

If, when a customer enters the service station, he merely wishes to purchase a part, or parts for his car, so that it will not be necessary to fill out a Shop Order for a long job, he is waited on by a stock salesman. If the sale is cash, a form is duplicate, pink and blue, the same size as the Shop Order and similar in general appearance, is filled out. This is known as a Part Sales slip. The disposition of copies is the same as in the case of the Shop Order, only it is tabulated for a stockroom, instead of a shop transaction. For every charge there is a cost, and vice-versa. No customer can be overcharged under the present system.

The flat-rate system is being used, as well as charges for material and labor and the customer can have his choice. The tabulated expense for rebuilding certain units has been found of great convenience. In ninety-nine cases out of one hundred at this service station the work is done on a cash basis.

When work has been completed for a

**Parts Card**—Close record is kept by this means, of parts charged in and out of stock. Its entries are self-explanatory

long job on a Shop Order, the service manager calls up the accounting department when the customer arrives to take away his car. If the account is open, the customer signs the shop order, and the form is sent to the office, where it is tabulated and invoiced.

Under the general classifications of the forms used at the Brockway service station, as mentioned, class 2 is for forms used in special cases. These may be considered as follows:

- (1) Form for parts returned for credit, inspection or repairs.
- (2) Shipping order for returned parts.
- (3) (a) Record sheets for returned goods reports, or defective parts to factory for adjustment, as filled out in a loose-leaf book, and (b) for defective parts not adjusted, likewise handled.
- (4) Returned goods, or defective part tag.
- (5) Emergency call.

Taking up the first of these in the group: The form for parts returned for credit, inspection, or repairs suffices for all three cases. The form is made out in duplicate, one copy being pink and the other blue. The form is the same size as the Shop Order.

#### Credit for Returned Parts

The basis of the form, of course, is the rule that when a customer returns parts promptly, they are good for credit. The reasons for returning parts are: Because they are defective; because they are the wrong parts; because the customer wants them inspected, or because he wants them repaired.

If a part has been returned by a customer and found defective, or a wrong part and must go back to the factory, it is tagged with a red card, 3 by 6 in. and dropped into a special bin, there to remain until it can be shipped. This

**Part Sales Slip**—This form is used where the customer merely wishes to buy parts. It is made out in duplicate

form is known as a Defective Part Tag. It has a detachable stub at the bottom to be given to the customer.

It will be noted that information on the red returned goods tag and on the parts returned form tally. There is a record in the office of the part sent back on the parts returned form and on another form. The disposition of the parts returned form is the same as that of the shop order.

#### Recording Returned Parts

When the parts for return have come to the office, they are tabulated on a record sheet fitting in a loose leaf book. These sheets, with columns and rules for entries, are 5½ by 11¼ in. each, although the book so opens that entries are made all the way across opposite pages, as if the two were one sheet. There are sheets in this book headed "Defective Parts to Factory for Adjustment" and "Defective Parts Not Adjusted." In this connection there is correspondence with the factory under a 10-day follow-up plan. If there is delay, the service manager reports the reason. When the correct part has been shipped on in exchange for the defective, or wrong part, the bookkeeper makes the proper entry in the record and the part is placed to the credit of the customer, ready for him when he calls for it.

On the "Defective Parts to Factory for Adjustment" sheet, the transaction is followed out to its final disposition. When such disposition has been made, the credits are issued, as are the memorandum and charged stock.

Under the heading "Defective Parts to Factory for Adjustment" are the following detailed entries: Returned—

(Continued on page 32)

## If Your Service Is Right Let People Know About It

WE HAVE been told repeatedly that the best advertisement the dealer can get regarding his service policies is from satisfied customers. This is quite true, but we often wonder just how far the satisfied customers' enthusiasm and boosting go towards getting new business. Of course they will tell their friends all about you if you give them the right kind of treatment, but is it not a good thing to occasionally use newspapers published in and around your territory for extension of your service?

The Redman Motor Co., Abileen, Kan., thinks so, and we reproduce herewith a sample of the kinds of advertisements this concern uses to let other than its regular customers know about its service. And, instead of going into generalities, notice that this advertisement points out particular phases of service for which the company is especially well prepared. By thus itemizing its business the company is almost sure to call some car owner's attention to the fact that he ought to have his battery looked over, his car re-painted, or anything else. In addition, it is an excellent plan to let your old customers know that you have perhaps tooled up the shop more fully and are prepared to give them even better service than before.



### TO REMIND YOU OF MAXWELL-CHALMERS SERVICE

DO you realize that before buying a car you should look into that vital "specification"—the service you may expect AFTER you have spent your money?

The bright, new car will please for a day, but are you going to have continued use and satisfaction through permanent efficient, accessible owner's service?

Maxwell-Chalmers owners may quickly answer "YES" for Redman Motor Company's after-the-sale service has been a great factor in building up Dickinson County's largest automobile business.

Under the direction of Mr. J. O. Roberts, formerly Field Service Inspector of the Maxwell Company we've organized a force of capable, energetic mechanics. Each man is qualified to make good in his specialty. All are anxious to please and serve you well.

To house this organization there is almost completed a handsome, modern building, fully equipped with every facility necessary to the Redman service standard. The erection of this building is convincing proof that you may get Maxwell-Chalmers service for many years to come.

From tire to top—your every need in mechanical or electric service may be supplied. Your storage battery may be inspected, repaired or replaced. The dust-proof paint room gives facilities for artistic refinish jobs.

Then last, though of great importance—a parts stock supplying hundreds of dealers in Kansas, Colorado and Oklahoma is instantly available for local service.

### REDMAN MOTOR CO. Maxwell and Chalmers Distributors

RESIDENCE PHONE 1460

#### C. E. McCUNE AUTOMOBILES

SALESROOM CORNER THIRD AND SUTPHIN  
PHONE 1922  
MIDDLETOWN, OHIO

Jan. 22 Feb. 22 Mar. 22 April 22 May June July Aug. Sept. Oct. Nov. 22 Dec. 22

#### PROSPECT RECORD

Car No. 2673

Name John Doe  
Address 311 Main Street Phone 176  
Business Real Estate  
Prospect for Pearless now owns Haynes  
How learned of Salesman  
Demonstration given Mar. 21 Date sold Nov. 21 Model Pearless T  
If competing car purchased, state name \_\_\_\_\_  
Reason: \_\_\_\_\_

#### SERVICE RECORD

Car No. \_\_\_\_\_

#### SERVICE RECORD

Owner \_\_\_\_\_ Car No. \_\_\_\_\_  
Address \_\_\_\_\_ Phone \_\_\_\_\_

By presenting this card on following dates at \_\_\_\_\_ garage

\_\_\_\_\_ street, you will be entitled to free service on your car.

plus cost of grease and oils used.

Service to consist of general inspecting, greasing, charging, oil, etc.

NOTE.—While this service is free to you, we are very anxious to have you bring your car in promptly each month, for we feel sure that we will both benefit by your doing so. Your assistance will be greatly appreciated by me.

Sincerely yours,

Phones 1922 and 1460

C. E. McCUNE,

Jan. Feb. Mar. April May June July Aug. Sept. Oct. Nov. Dec.

### Three Cards for Service Record

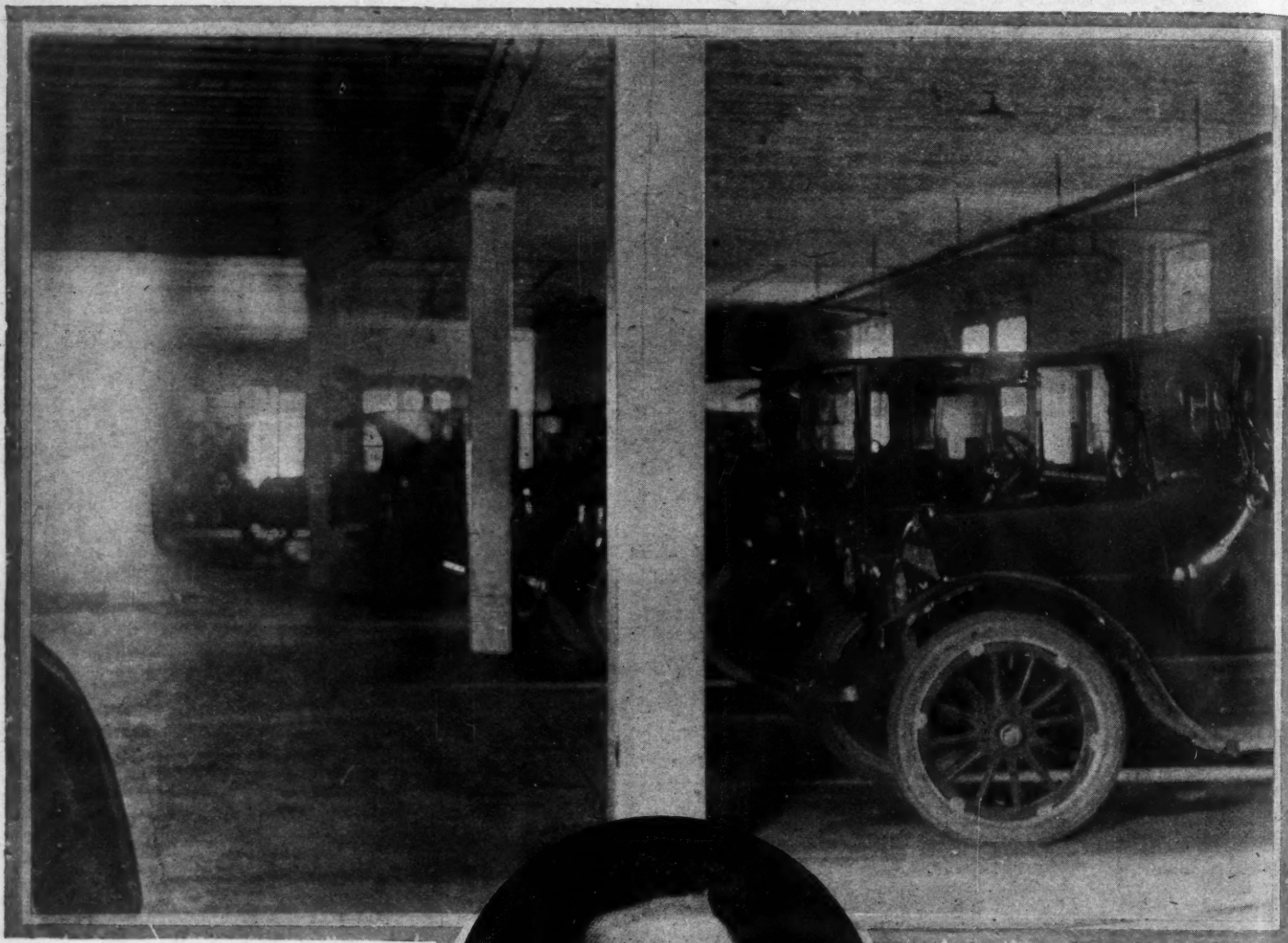
HERE is a suggestion from C. E. McCune, a Middletown, O., dealer who seems to have worked out a successful way to handle the service question by use of the accompanying three cards, which originally are one, being afterwards separated and sent to the dealer, service station and customer. This card is the one retained by the dealer and is made out by the salesman. It gives a complete record of what the man bought and why.

These two cards are identical, one of which goes to the service station and the other to the customer. In this way the customer knows exactly what he may expect in the way of service to be charged for, or such free service work as inspecting and adjusting. Where lubricants or any other supplies are necessary in this free inspection, they are, of course, for. The customer holding such a card naturally takes advantage of the offerings thereon, and besides, it helps run the service station more systematically because the service man knows exactly when a certain car will come in.



# How Morris Adler Talks to His Employees

His "Service Policy Talks to Employees and the Public" Have Made His Business Both Pleasant and Profitable



IF the now famous Statler Codes for employees could bring about a better understanding between the managements of the hotels and their employees and both and the public, why not adapt the same successful ideas to the motor car business? So thought Morris Adler, general manager of the Morris Adler Co., Dodge dealers at Quincy, Ill., who believed that such a code for his garage would result in greater efficiency.

Mr. Adler has had issued in brochure form, "Service Policy Talks to Employees and the Public." While these talks are addressed mainly to employees, they are intended, as in the case of the Statler codes, to inform patrons of the garage they service they may expect from every individual there.

"Service with a Smile," is the slogan of the Morris Adler Co., which the head defines as "rendering service with a cheerfulness that adds pleasure to the other advantages of doing business here." The point is made at the outset that the garage is operated primarily for

Morris Adler, Quincy, Ill., dealer who among other things is a thorough believer in cleanliness for the service station. Above, a section of the main floor in the Morris Adler service station, showing a number of cars in storage. Note the clean white posts and floor

the benefit and convenience of its customers there could be no garage. The code which defines the duties of the employees and how they may live up to the principles of the company, explains that these are simple facts, easily understood, and then goes on to say:

\* \* \* \*

Any member of our Force who lacks the intelligence to interpret the feeling of Good Will that the Morris Adler Co. holds towards its customers, cannot stay here VERY LONG.

\* \* \* \*

NEW CUSTOMERS are surely just as valuable to us as OLD CUSTOMERS—remember that; for each new Customer is an Old Customer in the making.

See that you do your part to make him want to come back here, with his family and his friends.

Impress upon him the fine good-fellowship of the place.

Never be perky, pungent, or fresh—the Customer pays your salary as well as mine.



## Here are Some of the Appointments of the Morris Adler Company Garage That Contribute to Its Popularity Among Motor Car Owners

Electrically Operated Doors.  
Roller Bearing Turn Table.  
Electric Elevator.  
Daylight Shop.  
Exhaust Gas Removers.  
Electric Blowers.  
Automatic Compressed Air System.  
Working Light Extension System.  
Hot and Cold Shower Baths.  
Workmen's Compensation and Public Liability.

Movable Work Benches.  
Complete Welding Department.  
Complete Radiator Repair Department.  
Complete Power Reboring Outfit.  
Painting, Trimming and Upholstering Department.  
Stock Room under Perpetual Inventory System.  
Thoroughly Systematized Office.  
Tile and Dust-Proof Concrete Floors.  
Women's Rest Room.

Men's Rest Room.  
Complete Line of Accessories.  
Quick Service Filling Station—Oil, Water, Gas or Air.  
Experienced Floor Man to Direct You and Attend to Your Wants.  
Wash Rack in Competent Hands.  
All Night Service.  
Pronounced by State Fire Insurance Inspectors one of the Cleanest and Most Orderly Garages in the State of Illinois.

### Pertinent Paragraphs From the "Service With a Smile" Booklet

Have every one feel that for his money, we want to give him more sincere service than he ever before received at any Garage. The employee who helps to perpetuate this plan is never out of a job, nor does he escape the eye of the Man Behind the Scenes—The Boss.

\* \* \* \* \*

At rare intervals some perverse member of our force disagrees with a Customer as to the rightness of this or that.

But these are PERMANENT INSTRUCTIONS: No Employee of this garage is allowed the privilege of arguing any Point with a Customer.

In case of a dispute with a customer, the employee should at once call the attention of this matter to his foreman. Wrangling has no place in the Morris Adler Garage.

\* \* \* \* \*

A GARAGE has many different things to sell. But one very important thing is—SERVICE.

The Garage that sells poor Service is a Poor Garage.

The Garage that sells Good Service is a Good Garage.

\* \* \* \* \*

THE SERVICE of a Garage is not a thing supplied by any single individual. It is not Special Attention to any one Customer. Garage Service—that is, Morris Adler Garage Service—means the limit of Courteous, Efficient Attention from each particular employee to each Particular Customer.

This is the kind of Service a Customer pays for when he pays us his bill—whether it is 60c for a night's storage, or \$80.00 for an overhauling job. It is the kind of Service he is entitled to.

Every customer who enters the Garage Door, comes in because he believes he can buy something here BETTER than he can buy it anywhere else.

It rests with every employee of this garage from the porter up—whether he goes away disappointed or pleased.

\* \* \* \* \*

A Doorman may open the door in a manner to assure the new Customer that he is in HIS GARAGE where people are prompt to serve him. Or,—He can open the door in a way that sticks in the Customer's "crop" and makes him expect to find a surly, impertinent workman at his service.

To be able to give a Customer a warm feeling, adds dollars to the income of the

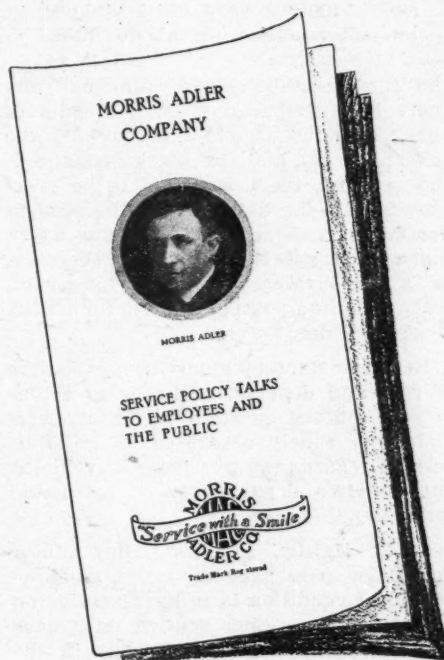
Garage and Dollars to the salaries of our employees.

And just here take heed, that in all Minor Discussions between Morris Adler Company Employees and Customers, the employee is Dead Wrong—from the Customer's Standpoint and from ours.

It is these little things that send a customer away pleased. And the Company has gained another booster.

\* \* \* \* \*

The Foreman (or any other department head) who can systematize and organize his department so as to save time or help, can



This booklet dealing with service policy talks is sent out by Morris Adler to employees and the public and has proved an effective means for building prestige

make more money for the Morris Adler Garage—and more money for himself. Every dollar saved in any department, means that we can sell more Service for the same price. It makes Morris Adler Garage Service a better, Bigger service and it makes Somebody a better, bigger job.

Every item of extra courtesy contributes toward a better pleased customer and every

pleased Customer contributes toward a better, bigger Garage.

\* \* \* \* \*

The customer of a garage goes there because he expects to receive service with celerity, courtesy and cheerfulness.

Now and then an employee is found who adds a bit of his own personality to his service. Such a one shows a bit more intelligence—initiative—perspicacity—than his fellows. The Customer finds his smaller wants anticipated, for instance: (A customer says: "See if I need any oil in my engine.") The employee not only looks at the engine and advises him of the oil that is needed, but also has the intelligence to examine his tires, and to see there is plenty of water in the radiator. If the tires need "pumping up" he does so. This is unexpected service. This is what we mean by the customer's smaller wants being anticipated.

\* \* \* \* \*

After defining the duties of his employees, Mr. Adler has a few friendly words with his customers, as follows:

\* \* \* \* \*

This talk is written because every little while I see some customer of ours who won't let us give him the good service that is here for him.

Nearly always it is because he does not realize that it takes two—the server and the served—to make good service.

\* \* \* \* \*

Almost every day Morris Adler Garage has a complaint from some customer, about a detail of service.

Every complaint has conscientious attention. Morris Adler's garage is operated on the theory that the customer is always right.

But—quietly, now—sometimes we find out, whether we admit it or not, that the customer was not right in that particular instance.

Before you read another word let's have a perfect understanding of these two things:

1. This talk IS NOT an apology for any lapse from the high standard of Morris Adler GARAGE SERVICE. We admit such lapses, which exist because they can not be prevented; service being a humanly-rendered thing; they can only be kept at the minimum.

2. The Morris Adler Company prides itself upon its ability to please the "particular" customer.

# Separate Buildings for Trucks and Tractors

Is Thought Expressed Generally by Philadelphia Distributors and Dealers to Question, "Shall We Divide Service."

PHILADELPHIA dealers and distributors in the main prefer the servicing of passenger cars, trucks and tractors separately, many of them to the extent of handling these three types of vehicles in different buildings. This applies to dealers who are handling at least two of these types of machines and also to dealers in only a single type, but who have decided ideas on what is the practical and economical procedure in servicing as a general proposition.

Tractors are such an entirely different proposition, both as regards service and sales, also, that nearly all dealers agree that they should be serviced in different buildings, especially in a city of any size.

Of course, for a small town, good results are often obtained where tractors are serviced and sold from a large garage; but tractor service has not kept step with passenger car and truck service, it is generally acknowledged and most dealers who are selling tractors where there is opposition from the implement dealer, are glad to sell and service them wherever they can; but where opportunity offers, it is noticed that separate buildings house the tractors, even though there may be a sample or so displayed in the passenger car or truck salesroom or service station.

## Service Methods Different

The various reasons, economic and otherwise, advanced by dealers in motor vehicles, for separating the service of passenger cars and trucks, may be summed up thus:

The methods of servicing are, or should be different.

Experience has shown that it is the best policy not to have the same mechanical force service passenger cars and trucks, just as it is usually a poor policy to have the same salesforce merchandise the same vehicles.

Where the passenger car and truck mechanics are in close proximity, there is a tendency to interchange the work, which should not be done.

A passenger car mechanic may be a mighty poor truck mechanic, and vice versa.

In a big city it costs entirely too much per square foot to have the servicing done in a congested office, or sales and show-room building locality. The rent is the big item and the overhead where trucks and passenger cars are serviced in the office building districts usually is tremendous.

There should be separate buildings for servicing passenger cars and trucks from the viewpoint of space; for unless



Above is reproduced the first page of an article which ran in Motor Age last week. On this page are some opinions from prominent distributors answering this question

the service station is a huge one and there is a comparative small amount of servicing done at one time in both the passenger car and the truck sections of the stations, there is bound to be overcrowding to the detriment of the passenger car servicing, for trucks take up so much more space. It is also necessary, as a usual thing, to work longer on trucks than on passenger cars, for trucks receive harder usage.

Here are some opinions from executive officers and department heads in Philadelphia, on the question of keeping servicing as widely separated as possible, both as regards the two types of vehicles and the two departments of sales and service.

A. E. Maltby, Bigelow-Willey Motor Co., Paige passenger cars and trucks—"An ideal condition is to have service on passenger cars and service on trucks kept separate, although possibly in the

## Some Reasons Given by Service Men That Passenger Cars, Trucks and Tractors Should Have Separate Buildings.

† A passenger car mechanic may be a poor truck mechanic and vice versa.

† Motor trucks take up too much room to be serviced with passenger cars.

† Methods of servicing passenger cars and trucks are, or should be, entirely different.

same building. Passenger car mechanics should not be taken away and placed on truck service work, and vice versa. From an economical standpoint, it is not the best policy to have even sales and service in the same building in a big city. While segregation means two buildings, two organizations, two sets of heating apparatus, two sets of elevators, and the like, should there be more than one story to the separate service building, nevertheless, all these items are more than offset by the item of rental. That is, the space in the valuable, congested office building district, which might be taken up by the service department, could be rented at a profit, while the service and could be maintained more economically in a less expensive locality.

"Besides, motor trucks take up too much room to be serviced with passenger cars, under ordinary circumstances.

"It is also best to keep the salesman in either the passenger car, or the truck divisions, away from the service end, thus avoiding having them drawn into arguments with customers over service. Service is naturally a separate business from selling."

A. W. La Riche, Velie trucks and passenger cars and Scripps-Booth passenger cars—"I believe that where trucks of more than a ton and a half capacity are handled, the servicing for them should be done in a building separate from the servicing of passenger cars. It is a case of there being insufficient room for the servicing of both, where there are service stations of anywhere near ordinary size, especially in the larger centers of population.

## Trucks Use Much Space

"Undoubtedly, the heavier trucks need a separate building to be properly cared for, on account of the space they occupy, even when assembled, to say nothing of when they have been taken apart."

James Sweeten, Jr., Sweeten Automobile Co., and Sweeten Used Car Clearing House—"The methods of servicing passenger cars and trucks are, or should be, so entirely different, that the servicing should be done, where possible, in separate buildings. The same organization is not suitable for handling both trucks and passenger cars, whether in the sales, or in the service end.

"The truck service man, or mechanic, needs a more thorough schooling, as a usual thing, than the passenger car service man, or mechanic. If a truck is allowed to be used until it needs repairs urgently, it goes bad in a much shorter time than a passenger car and needs a more thoroughly trained and a specially

(Continued on page 32)



# Enabling the Tractor Dealer to Fulfill His Service Responsibilities

By Selling a Full Line of Power Equipment He Can Carry the Overhead Expenses of Efficient Service Facilities

BY FRED M. LOOMIS

OKLAHOMA CITY, Okla., March 22—The education of the dealer so that he shall be self-sufficient and self-reliant in service on modern power farm equipment is a fundamental principle in the business policy enunciated by the Cardwell-Lyman Sales Co. of this place.

The Cardwell-Lyman Sales Co. began here a little less than a year ago with the Cletrac tractor. From the very outset it was plain to H. W. Cardwell, the founder of the business, that success for the dealer in the tractor business would come only through a knowledge of what service consisted, of the equipment necessary to give it and the disposition to render it.

In order to meet the condition that a dealer hardly could afford to equip himself for service unless his business should be of sufficient volume to be profitable, it was necessary for the firm to take on a complete power equipment line and to develop exclusive power equipment dealers.

## Sell Complete Farming Equipment

Therefore, in addition to the Cletrac tractor the company took on a complete line of power farm operative equipment, the Toro motor cultivator, the Sharples cream separator and the Alamo farm lighting plant and soon it will add a motor truck.

It was pointed out to the dealer that this line would enable him to motorize the farm completely, and that the ensuing volume of trade would enable him to carry the overhead expense of an efficient service equipment easily.

Almost from the first the theory of the company proved true. With an incomplete line and a small force of dealers 376 Cletrac tractors were put into Okla-

*This story is about an exclusive power-farming dealer, a new type of dealer brought into existence by the farm power business. He is not the old implement dealer, neither is he the man who sells motor cars. He is the man who sells to the farmer the things that motorize his place—tractors, trucks, farm light plants, implements, etc.*

*Tractor manufacturers and branch house managers welcome this new kind of dealer because he does several things which dealers of the other kinds do not. He confines himself exclusively to the power equipment lines. He finances himself and from the very first could see no other plan than the spot cash method of doing business. He equips himself for service both in a material way and in the matter of competent mechanics. He was a source of profit to the concern because he called upon it for none of the things the old time retail implement dealer persisted in calling for. Naturally, these things account for the welcome which has been accorded to him and afford an explanation of why he is being encouraged by the tractor manufacturers.*

*The exclusive dealer has come into existence because the ideal man for carrying on the great work of motorizing farms did not come in sufficient numbers from any other source. The old time implement man selling horse-drawn farm machinery for generations did not measure up to the necessary conditions. He was not equipped for service and he still believed he could call upon the factory or branch for service as was the custom in the old days. Bigger factory production, however, tolerate these conditions. It was necessary for the dealer to be a bigger factor and to take over the sale and care of the apparatus.*

homa during the latter part of 1919. The company had but fifty-eight dealers, twenty of whom were exclusive.

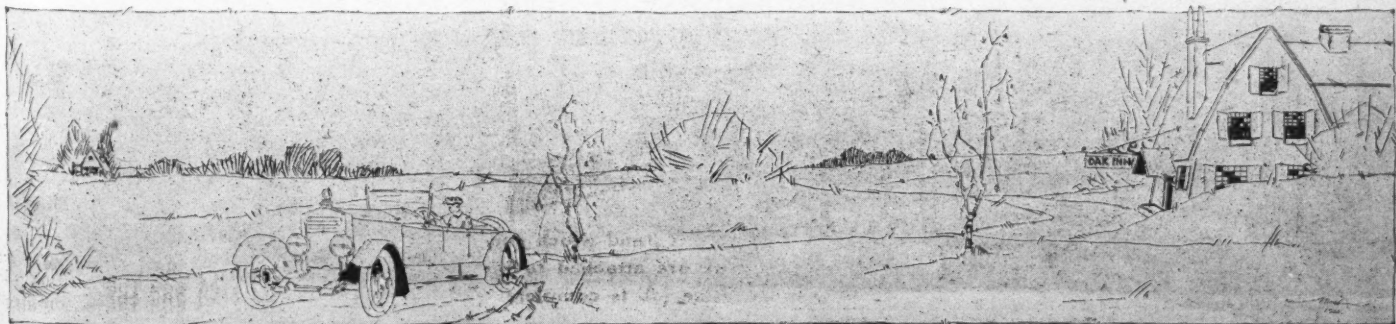
At present twenty-one salesmen are on the road in motor cars selecting and training new dealers and the company has bought 1000 Cletracs for its 1920 trade.

Among the things the dealer is compelled to do is, if he is a carload buyer, as most of them are, is to carry at least \$50 worth of spares for every tractor he buys and to charge his customer for all the service he gives. Cardwell says "free service has been the bane of implement and tractor business and I intend to prevent it in my dealer organization if I can."

## Hold Service School

The company has been holding a service school here this week, attended principally by service men in the employ of the company's dealers. In fact, Cardwell will overlook nothing to put his idea across that the tractor dealer must give good service if he is to succeed.

In view of the fact that nearly all of the better known tractors are sold in this territory by old line implement concerns who adhere tenaciously to the theory that both sales and service should be a function of the branch house and that with neither should the dealer have anything particularly to do, this policy of Cardwell's is brand new. In taking this view of the service obligation Cardwell is followed by some of the other new organizations which are coming into the field and it is as certain as anything can be that a contest is growing in the Southwest between the old and the new in tractor service ideas. The development and results of this contest will be interesting to watch.



# Two Forms Only in this Service System

## How T. J. Northway Has Simplified Keeping Record of Service Work in His Business

**W**HAT are the simplest terms to which a service system can be reduced and yet maintain complete and satisfactory records that can be instantly referred to, which records will contain all essential information with a minimum of bookkeeping by mechanics?

This was the thought that Thomas J. Northway, of Rochester, N. Y., had in mind when he installed his present system, which has purposely been made as simple as possible. Years of experience in service work convinced him that while proper training might make a man either a mechanic or a bookkeeper, that the two callings were separate and distinct, and that any attempt to combine them was futile or fatal. So the Northway service system has been reduced to two forms.

The first of these is the instruction and time slip; the second a material card. These cards,  $4\frac{1}{2}$  by 9 in. in size, are stapled together and bear a duplicate job number. They are attached to the car when it enters the garage and remain attached until the job is completed. They are then deposited in a slot that leads from the repair room to the service manager's office, and when this official finds them on his desk it is a notification that the car is ready for the customer.

### Classifying Repair Jobs

The method of handling service in the Northway establishment is as follows: Repair jobs are roughly classified into two classes; those that involve merely an adjustment, such as timer or ignition trouble, and those that involve more

labor, such as replacing a shafting, installing a new transmission or a general overhauling job. The customer drives into the garage and is received by the service manager, who listens to the complaint and diagnoses the case.

Upon this individual a great deal of the success of the organization hinges. One of the secrets of Northway's success is that of fitting the man to the job, or rather, selecting the right man for the job. The personal equation has been stressed greatly in building this efficient organization and one of the main reasons that Northway is able to handle the amount of service work that he does is because his service manager is able to diagnose the ills and troubles of motor cars quickly and correctly. In this way both time and money is saved the customer and the service station.

### Filling Out Instruction Card

Having diagnosed the case, the foreman fills out the white instruction slip. This slip first of all contains a place for the car number, which is always filled in, no matter how trivial the job, for reasons that will appear later. The name and address of the customer follow and then the time at which the completed job is promised. The customer's telephone number, if he has one, is next written in, and then follow the instructions to the mechanics in the place provided.

If the case simply involves ignition trouble or any one of the score or so of adjustments that an expert mechanic can make in an hour or two at the most, the work is done right in the garage, but if engine trouble is involved, or any other trouble that seems to necessitate tearing down, the car is put on the elevator and sent to the repair shop, which is on the second floor of the building.

On the white instruction card is also provided a space for the workman's time, and the total number of hours worked by each man on the particular job is charged up in this space. On this slip are also charged the amount of gasoline, oil and grease used on the job. On the green material slip, stapled to the instruction slip, are charged all parts and materials that are used.

### Easy for the Mechanic

The filling in of these simple blanks is all the bookkeeping that is required of the mechanic. As previously stated, these cards are detached from the job when completed, slid through a slot to the service manager's desk, and from there collected and taken to the bookkeeping department, where the time and material is computed and the customer's bill made out.

The image shows two forms used by T. J. Northway. The first form is a 'CHARGE SLIP' with a header 'THOMAS J. NORTHWAY' and a sub-header 'CHARGE SLIP'. It has fields for 'Name', 'Date', 'Car', and 'Address'. The second form is an 'INSTRUCTIONS' card with a header 'INSTRUCTIONS' and fields for 'Car No.', 'Name', 'Date', 'Address', 'Promised', 'Phone', 'Gasoline', 'Oil', 'Grease', 'Workman', and 'Hours'. Both cards are stapled together and attached to the car.

Here are two forms used by T. J. Northway of Rochester, N. Y., and which constitute the entire system of record on service work. They are attached to the car when it enters the shop and remain attached until the job is complete



Upon the service manager also devolves the oftentimes unpleasant task of furnishing the customer with an estimate of the cost of repairs. Here again the personal element appears. No attempt is made to tell the customer to the last penny just what the repairs will cost, but from his conversation with the customer the service manager is able to learn the class of job that is wanted, and with this in mind he is able to tell the customer that a certain amount of work will cost "about" a certain figure. If after the job is torn down it is discovered that repairs other than those originally planned are needed, an authorization for the extra work is secured by the service manager by the use of the telephone.

To garagemen and service specialists who have worked on the principle of furnishing the customer in advance with the exact cost of the work, this may appear a rather loose method. But the only real test of a system is whether it works out satisfactorily, and this the

Northway system certainly does, which would seem sufficient justification. Through long experience his diagnostician is able to tell in advance within a very small margin either way the cost of any repair work.

It has been found necessary to place the car number on every instruction slip that goes to the repair shop, for the reason that many customers own several cars of the same make and the repairs made to each respective car are charged off as depreciation by the owner. Oftentimes they are unable to remember just which car was repaired and a reference to the filed instruction slip frequently saves time and temper that would otherwise be wasted in argument.

#### Each Man a Specialist

In an organization as large as this it is inevitable that there should be a great amount of specialization. The business has been thoroughly departmentized and in the repair department special experts in many lines of work have been developed. There is one man, for instance,

who makes a specialty of radiator work, another whose specialty is tuning an engine until its hum is a perfect rhapsody, while still another can yank out and replace a faulty transmission in less time than any other man in the shop. By giving out the work in such a manner that the specialists receive the work to which they are best adapted the service manager is able to reduce repair bills in many instances.

"Although our charges per hour for our workmen's time is higher than in many of the repair shops of the city, in most cases our customer's repair bills are lower," said Charles Frisbie, general manager of the Northway organization.

While this statement may sound paradoxical, it is nevertheless a fact and the reason it is a fact is because he has gone to considerable trouble and expense to fit up his machine shop with the best working equipment that it is possible to procure.

For instance: A motorist is towed into

(Continued on page 32)

## A Monthly Inspection System That Is Working Out Well

AROUND the first of the year the Arthur Jones Electric Company, Chicago, adopted a system of free inspection which is bringing in satisfactory re-

1920												FREE INSPECTION	
THIS CARD ENTITLES													
MR. <i>C. H. Burnett</i>													
TO FREE MONTHLY INSPECTION UNTIL DECEMBER 31, 1920 ON													
STARTING, LIGHTING, IGNITION SYSTEM, ALSO BATTERY													
ON ANY AUTOMOTIVE VEHICLE													
ARTHUR JONES ELECTRIC COMPANY													
2837 SOUTH STATE STREET													
CHICAGO													
PHONE COLISEUM 8700 (OVER)													
DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	

turns. Something like fifteen thousand car owners of Chicago received letters similar to the one reproduced herewith and were given free inspection cards like the one above. This card entitles the holder to free monthly inspection on starting and lighting, ignition and battery work. Before the letters were sent out the make of car each owner had was ascertained so that the letter might be worded accordingly. A great many owners are taking advantage of this system and the company keeps an accurate record of all cars coming in as a result of the inspection card. Every time a car comes in the service man makes a punch mark in the space designating the month. On the reverse side of the card is listed the several makes of apparatus on which the company is prepared to give service.

Dear Sir:

We take pleasure in announcing that we have been appointed PARTS and SERVICE representatives for the BIJUR MOTOR APPLIANCE COMPANY, manufacturers of the electric lighting and starting equipment on your automobile.

We have unexcelled facilities for handling service and invite you to drive your automobile to our service station for inspection and enclose herewith, with our compliments, FREE INSPECTION CARD.

Assuring you that it is our highest desire to maintain the same high standard of service as in the past, we remain

Yours truly,

J/L

ARTHUR JONES ELECTRIC CO.

*Arthur Jones*  
President.

Enc.

P. S. INSIST on GENUINE parts, guaranteed for service by the maker of your electrical equipment.



# EDITORIAL



## Need for More Intensive Service Methods

**L**IKE the chain assembly propositions in our factories the automotive dealer's service work must never stop. It must be kept going constantly. Delays are costly and put a crimp in the dealer's reputation for maintaining an efficient service station. The work must be kept going, because the future success of every dealer depends upon the service he is rendering on the cars, trucks and tractors sold, to say nothing of the vast increase in the number of automotive vehicles to be made in the next few years.

**R**EGARDLESS of whether the job is big or little, it behooves every dealer, generally through the shop foreman or service manager, to see if it is not possible to do that job just a little bit quicker and better. Many times it means simply making some sort of jig or fixture, requiring about half an hour's time, which in a week's time may save something like 4 or 5 hours. A good many of our larger shops are fitted out with such devices as engine stands, connecting rod and piston aligners, hoists, etc., but the attempt to speed up the work should not end there.

**F**ACTORIES are co-operating more and more with their service stations and it is getting to be more and more the custom for the factory to furnish the service men with

instructions covering the servicing of every part of their product. These instructions are illustrated in many cases and a time limit put on each job. In this way it is possible to adopt the flat rate system of repair work, which already has shown itself to be a wonderful step in the advancement of service work.

**L**ABOR-**S**AVING devices, whether home-made or bought on the market are the means whereby dealers can double their profits, providing such devices fill the immediate requirements of that dealer. The question of initial cost of the investment should not deter the dealer, because experience has shown that the shop well toolled up is the one sought by the majority.

**W**E must expect to get more work out of our present repair shops and service stations, if we are going to handle efficiently the vast amount of service sure to come with the great increase in production. We may not have many more service stations, but certainly we must get more intensive service from the means at hand. And one way to get this is by the installation of labor-saving devices, which might be applied to the office, the service floor, the shop, electrical department or any other department.

## Good Roads

**M**ORE and more it becomes apparent that the men of the automotive trades must keep their attention focused on the expenditure of the good roads funds which have been appropriated by the various states. If they are to reap a benefit from these roads proportionate to the amount of energy they have expended in fostering the good roads movement, it behooves them to keep themselves interested.

**A**T a meeting of an automobile trade association in one of the large cities recently it was declared that the roads funds in that state were in peril of being expended entirely for the benefit of the railroads. In other words, roads were to be constructed which would act as "feeders" to the railroads rather than as part of a comprehensive system of state highways. To this end, it was said the railroads had appropriated a fund of \$2,000,000 for lobby purposes.

**T**HIS may or may not be legitimate business enterprise. It is only natural for any industry to wish public improvements which will redound to the benefit of that industry. And the railroad industry is no exception to the rule. But the automotive industry should take a page from the railroad's books and see that its interests are safeguarded in the expenditure of the road's funds.

**T**HE automotive trade is particularly entitled to consideration in this good roads question. It was the driving energy of the men of the automotive trade who put the good roads movement "over the top." Hundreds of men in the motor car business sacrificed time and money to make successful the various state bond issues for good roads, and certainly they should be entitled to representation when those funds are to be expended.

## High Speed Small Engines at Indianapolis Race

**T**HE Hoosier classic run this year promises to yield the greatest returns in knowledge gleaned over all the other races ever held on the famous Indianapolis speedway. The cars are to use the new three liter displacement engine. Three liter capacity means a piston displacement of 183 cu. in. With the piston displacement of the engines cut almost in half, it will be interesting to see whether or not these smaller engines will attain as great or greater speeds than the larger engines.

**T**HE attainment of high speeds was formerly thought possible only through the use of large engines. It is predicted that the average speed through the 500-mile grind this year will be as high as it was last year. And this with engines only half as large. The answer is seen in the better and more complete utilization of the power in the fuel, and the more efficient transmission of the power developed. Not that the power transmission machinery is hopelessly inefficient now,

but that the balance of the component parts will be better, so that every effort of the car will be in a forward direction.

**T**HERE is some talk current at present of one concern entering the race with an eight valve per cylinder engine; four in the head and two located at each side of the cylinder and set at an angle. Steps like this make it possible to develop a great deal more power from the fuel than was otherwise thought possible.

**T**O GAIN an adequate conception of just how large, or rather how small, 183 cu. in. is. An engine having a bore and stroke of 3.375 by 5 in. with four cylinders will displace just about 180 cu. in. Engines of this size have been produced that develop over 105 hp., which in ordinary passenger car practice requires an engine size of 4½ by 6 in. bore and stroke, with six cylinders.



# Illinois Dealers Form State Association

**SPRINGFIELD,** Ill., March 22—Automotive dealers from all parts of Illinois met here today to organize the Illinois Automotive Dealers' association to be affiliated with the National Automotive Dealers' association and to comprise members of the various city and county trade associations of the state. Attendance at the convention was not large in numbers but it made up for this by the enthusiasm of the dealers, all of whom seemed to realize that a state association is badly needed here.

Primarily, the state association will devote its attention to protecting the interests of the automotive trade throughout the state, particularly before the state legislature. In the past many legislative matters have been presented before the Illinois assembly which would have brought considerable trouble to dealers. Upon the Chicago Automobile Trade association in the past has developed most of the labor of fighting these measures and it is to relieve the Chicago association of this burden and also to take care of measures which would affect other parts of the state that the new dealers' body is being formed.

Following was the program of the convention:

## Monday, March 22

9:00 a. m. Registration.  
10:00 a. m. Meeting called to order.  
12:00 noon. Luncheon.  
2:00 p. m. "The Necessity of Organization."—H. B. Harper, president, N. A. D. A.  
"Dealers Get Together."—Harry G. Mooock, general manager, N. A. D. A.  
Report of committees.  
Election of officers.  
6:30 p. m. Dinner. Address by Gov. Frank O. Lowden.

## Tuesday, March 23

9:30 a. m. Forums; leaders, or dealers. Mr. Pinkerton, Peoria; truck

dealers, Mr. Nichols, Chicago; accessory dealers, Mr. Bass, Peoria; tire dealers, Mr. Bass, Champaign.

12:00 noon. Luncheon.

2:00 p. m. Addresses: "Our State—Our Business—Our Association," L. A. Piel, Chicago; "Automotive Merchandising," George Fritz, N. A. D. A.; "White Paint," Charles Hendy, Jr., Chicago; "Road Building From the National View," Pyke Johnson, N. A. D. A.; "Road Building in Illinois," Henry Paulman, Chicago; "Automobile Merchandising," E. S. Jordan, Cleveland; "Motorization of the Farm," A. R. Kroh.

2:30 p. m. Entertainment



State Capital Building at Springfield where the Illinois dealers are forming their state association this week

state constitution, however, the motor car dealers are eager to prevent any such measures finding their places on the statute books in the near future.

Membership in the Illinois Automobile Dealers' association is open to all dealers in the state on the payment of the \$15 yearly dues. The Chicago Automobile Trade association numbers more than half the dealers in the entire association and as this organization is almost certain to join the state association, the success of the new body is insured almost from its inception.

Chicago was represented at the convention by more than 20 members of the C. A. T. A., all of whom were accredited as delegates. Other delegations were present from Decatur, Urbana, Peoria and other cities where there are lively dealer organizations. These Illinois dealers were quick to see the advantages to accrue from a state

association and propose to give it their earnest support.

## COLUMBUS DEALERS ELECT OFFICERS

Columbus, Ohio, March 21—The annual meeting of the Columbus Automobile Trade association was held recently, when directors for the various divisions of the association were elected, as follows: Passenger car division, E. M. Pavey, Frank Lawwell and Fred Kaiser; motor truck division, Y. B. Jones, A. B. Coates and Frank J. Girard; garage division, Whitney Maize, W. H. Huffman and R. L. Hayes; tires and accessories division, Claude Carpenter, A. I. Fishbaugh and Neil O'Connor. The newly elected directors will meet in the near future to elect executive officers for the coming year. Reports received showed that the association is in excellent condition and much interest is displayed among the membership.

## Oregon Men Will Fight the Townsend Highway Measure

PORTLAND, Ore., March 21—War on the Townsend bill creating a Federal highway commission, now before congress, was declared at a state-wide conference of good roads workers of Oregon held here March 12, at which it was asserted that the passage of the Townsend bill would seriously handicap, if not kill outright, so far as federal assistance is concerned, the road building programs now under way in Oregon and other public land states.

The Oregonians propose a defensive alliance of all the public land states against the Townsend bill and for the Chamberlain bill, appropriating \$100,000,000 a year for five years to continue the present federal co-operation with the states.

In 1916, the Oregonians point out, congress passed the first federal aid road law, appropriating \$75,000,000. In 1919 this was amended and \$200,000,000 was appropriated. Out of this \$275,000,000, Oregon's share is \$4,332,178.27. Unless there is another appropriation the last of these funds will be distributed by June 30, 1921. Congress is now asked to appropriate \$100,000,000 for five years in addition to the post road money and this appropriation must be approved at the present session, they assert, if the present scope of road work is to be carried on.

Under this \$100,000,000 a year measure, which follows the program approved by the Louisville, Ky., convention of state highway engineers and commissioners, held in December, Oregon would receive \$1,576,152 for five years, and \$700,000 a year from an appropriation of \$10,000,000 a year for ten years for the building of county and state roads within the national forests. In the past Oregon received \$596,000 of the \$3,000,000 forest road fund, which will be exhausted June 30.

The objections made by Oregon and the other public land states to the Townsend bill are that it centralizes road building of the government in the hands of a few men and does away with the co-operation between state highway commissions and the government which now exists; that practically none of the public roads in Oregon and the

other public land states can qualify under the Townsend bill specifications whereby states will be reimbursed for construction of roads already built; that there are many such roads in the eastern states, which would accordingly obtain a big bulk of the money; and that, in short, it does not take into account the peculiar road building problems of the western public land states, with vast areas of government lands withdrawn from taxation, and completely upsets the road programs of these states, so far as federal aid is concerned.

Oregon is at present carrying out a road building program which by the end of next year will have expended \$30,000,000, including Federal aid under the present co-operative system. A measure appropriating an additional \$10,000,000 bond issue for roads is before the voters at the primary election in May.

### MICHIGAN TO BUILD ROADS

Mt. Clemens, Mich., March 18—Macomb county commissioners have let contracts for 12½ miles of paved roadway at a cost of \$540,320, one portion of

which will connect the South Gratiot pavement with the Centerline road one mile south of Utica. The contract price for this stretch is \$354,999. Another portion of the contract is for three and one-half miles connecting the Gratiot pavement with the Mack road.

All of the roads are to be of seven-inch concrete foundation with a two-inch asphaltic concrete surface and will be 18 ft. wide. Contracts let by the road commissioners thus far this year aggregate nearly \$800,000.

### ARKANSAS JOINS N. A. D. A.

St. Louis, Mo., March 18—Harry G. Moock, general manager of the National Automobile Dealers' Association has just returned to headquarters here after attending the annual show of the Little Rock Automobile Dealers' Association. Moock spoke before the dealers there on the necessity of organization for the protection of the industry. Robert E. Lee, secretary of the St. Louis dealers' association and manager of the St. Louis show accompanied Moock to speak at the banquet of Arkansas dealers following the dealer meeting.

Moock announced that the Arkansas Automobile Dealers' Association has affiliated with the National so that membership in the Arkansas automatically makes a dealer a member of the N. A. D. A.

## Belgium Will Stage Comeback in 1920 Race at Indianapolis

PARIS, France, March 18—The red, yellow and black flag of Belgium will jauntily ascend the mast when starters roll to the tape in the next International 500-mile Speedway Race, if efforts of Gustave D'Aoust, of Brussels, wealthy Belgian sportsman, culminate in success.

D'Aoust is a racing enthusiast whose courage was unbroken by four years of violence and destruction amid his native heath, and it is his one ambition to restore Belgium to her former position among the sport-loving countries of the world as soon as possible.

At present he is engaged in preparing a string of racing cars in an attempt to lift the world's speed championship at Indianapolis, and their participation in the event is contingent solely upon the speed trials that they will be put through upon their completion.

The Belgians demonstrated remarkable aptitude for racing before the war, their entries meeting with splendid success in competition with much larger and more powerful countries. One of the fastest combinations ever sent to the United States

### Their Last Scrap



Germany's war materials are going into the melting pot whence they will emerge as material for the automotive industry of the new republic—or is it an empire again 'this week?' Anyway, this is a scene at the famous Krupp works



was that of the late Josef Christiaens in his Excelsior for the Indianapolis race in 1914.

In this contest, Christiaens demonstrated that he easily carried more speed than any of his rivals, fleet footing it around the track with a smoothness that commanded utmost admiration. It was Christiaens's first 500-mile race, however, and he was not properly trained for the long contest, so that he weakened during the closing stages and finished no better than in sixth position.

A revival of Belgian participation in the Hoosier classic would prove intensely popular, the sentimental tie between the United States and the brave little nation that she rescued being of such a deep and enduring nature that a Belgian victory would be almost as much cause for enthusiasm as that of an American.

#### SCHEDULE ECONOMY RUN

Los Angeles, March 18—The fourth annual Los Angeles-Yosemite Valley gasoline economy run is scheduled to be held this year, May 7-8. The contest will be open to stock cars entered by Los Angeles dealers only. The first day will take the cars from here to Fresno and the second from that city into the valley with Camp Curry as the final destination. The interest it creates, the number of cars that usually participate and the difficulties of the run make it one of the most important economy contests in the country. Decisions are based on ton mileage. The competing cars usually are divided into three classes, according to prices.

## Macon Truck Tour to Have Educational Features This Year

MACON, Ga., March 21—Educational features are to be incorporated into the future annual Truck Demonstrations given by motor truck dealers of this city. This was decided upon in view of the peculiar situation confronting dealers in the South. It is believed that by teaching the truck owners the advantages of proper driving, maintenance and general upkeep work, that sales to farmers in the territory can be immensely increased.

It has been found upon investigation that most of the ills to which trucks are subject in this part of the United States are directly attributed to poor driving. A farmer, for instance, will invest \$2,500 or

## Twin Cities Service Men in Campaign for More Members

MINNEAPOLIS, March 19—Real progress was made at the second meeting of the Northwest Automotive Service Association last week and an overflow meeting is in prospect for the next session, March 26. Formation of the Northwest association was detailed in MOTOR AGE March 11 and already the organization gives promise of being one of the most extensive and liveliest in the United States.

At present the association's campaign is directed toward increasing its membership and it is hoped eventually to have the organization number representatives of every automobile service station in the entire northwest. This will include other cities than merely St. Paul and Minneapolis, taking in Duluth and other nearby large cities at first and then extending to take in the smaller towns. It is proposed to make the association really representative of the northwest and to spread the gospel of good service to all parts of that section of the United States.

Organizers have not been content with a mere general campaign for membership, however, and have adopted a plan whereby present members are to be held to account for their efforts in securing new members. The present members have been told off in pairs and to each pair has been given a list of non-mem-

ber service organizations which they are expected to bring into the fold. The plan to make the membership drive by teams rather than by individuals was adopted because it was thought greater progress could be accomplished in this way.

Last week's meeting was an extremely enthusiastic one and augurs well for the future of the organization. Members were pledged to the purposes of the association and as earnest of their sincerity were called upon to make a payment of \$1 on their first year's dues. This resulted in raising \$51 for the association's treasury, a fund ample on which to start the present organization operations.

#### PEERLESS CLAIMS NEW RECORD

Los Angeles, Mar. 18—A new intercity speed record is being claimed for the Peerless car. The 423 miles from San Francisco to Los Angeles via the Oakland ferry are said to have been covered in 9 hours and 20 minutes. This lowers the previous record, set in 1916, by seventeen minutes. The run was made at night and the checking was at telegraph offices in San Francisco and Los Angeles.

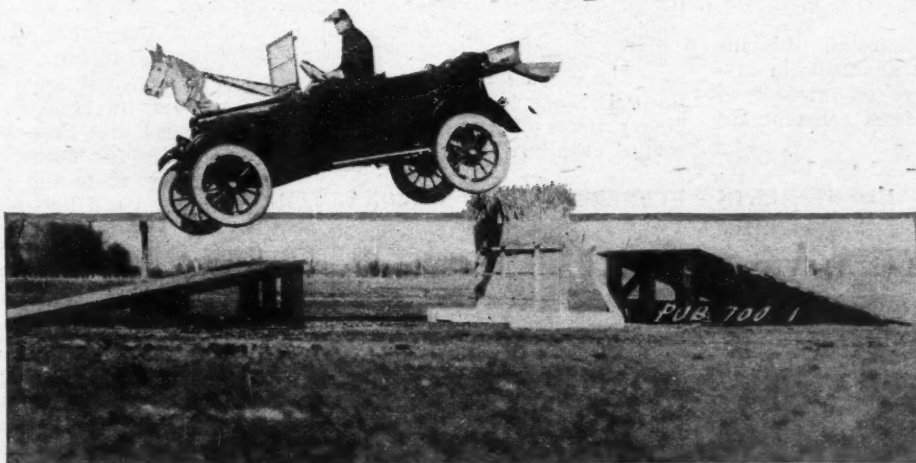
chaser has the feeling that he has not been given proper treatment by the man who sold him the truck.

It is proposed that in future truck tours the driving education will be an important factor. Farm labor in the South is, of course, largely colored and few of the colored men have had any experience driving automotive vehicles. It is impossible to change the labor situation, naturally, but dealers believe they can eliminate many of the sources of complaints by seeing that buyers of

trucks have men properly educated in their driving and care.

The Macon Truck Demonstrations have proved so successful that they have been adopted as an annual feature, quite as the automobile shows are now the annual feature for the passenger car dealers. Macon boasts of being the "heart of Georgia" and with the tremendous prosperity of the South at present there is a great field for truck sales, especially in the rural communities.

## A New Sort of Steeplechase



An Overland Four stock car was used as an added starter in the hurdle jumping contest at the annual horse and stock show at Denver. The car went eighteen feet through the air, clearing a 5-foot hurdle.

## Bureau of Mines Issues Gasoline Pamphlet

### Purpose of Paper Is to Point Out Most Efficient Production Methods

WASHINGTON, March 22—A paper dealing with the recovery of gasoline, by means of the absorption process, from the residual gas in plants where motor fuel is obtained from natural gas by mechanical compression and cooling, has just been issued by the Bureau of Mines, Department of the Interior, as Technical Paper 232, W. P. Dykema and Roy O. Neal, authors. In the absorption process the gasoline present in the natural gas is absorbed by oil and subsequently separated from the oil by distillation, or is absorbed in their treatment.

The purpose of the paper is to point out more efficient methods of production of gasoline and motor fuel. The vast amount of motor fuel being consumed at the present time, and particularly the rapid advancement in consumption of the product, due to the increase in the manufacture of automobile trucks, tractors, etc., that has taken place over a very few years, make conservation a paramount problem and any method which tends toward increasing the yield from our present resources is important. This paper deals directly with one method which may be used for obtaining a greater extraction of gasoline from our natural gas.

The investigation was carried on by actual field demonstrations and from the thirty plants tested throughout the mid-continent field it was ascertained that there still remained in the gas after it has been subjected to final treatment in the plant an average of .337 gal. of gasoline for every thousand cubic feet. The cost of auxiliary equipment necessary to treat this residual gas is justified, for it has been proven already by practical demonstrations that such equipment is soon paid for by the general increase in efficiency of the entire plant.

Recommendations regarding the installation of equipment are made in this paper which will prove of interest to anyone contemplating such construction work.

### ASK RAILROADS TO AID SHIPMENTS

New York, March 21—The railroads have been asked to co-operate in speeding the delivery of automobiles from the factories. Following a conference of representatives of the N. A. C. C. with the Car Service Commission of the American Railroad association at Washington last week, the commission issued an appeal to the railroads to rush freight cars to the automobile producing territories.

It was pointed out that the period of maximum requirements for automobile shipments has arrived, and the roads were impressed with the fact that every

freight car built for the shipment of automobiles should be devoted entirely to that commodity in order that every available piece of rolling-stock may be utilized.

The Car Service Commission showed keen interest in the conditions and assured the N. A. C. C. representatives that the effects of their appeal would be carefully noted, and if results were not satisfactory, other steps would be taken to insure an adequate supply of automobile freight cars for the manufacturers.

### TAKE OVER INDIANA OIL LANDS

Washington, March 23—Federal authorities have taken over the Osage Indian oil facilities which total 15,000,000 bbls. a year, in order to bolster up the failing supplies of fuel oil for the Navy, Shipping Board and War Department. Other drastic means will be taken to insure a steady flow to these Government consumers. The outlook, according to officials here, for the automobile owner is not the best.

The Council of National Defense held a meeting with the Shipping Board, Navy and War Department officials Saturday and are also contemplating other action, including the payment of oil

### Here was a "Skilled Worker"

*A Hartford, Conn., garage proprietor had been paying his colored car washer \$36 a week to wash cars, and during the heavy weather there was very little work to do. The washer's pay went on just the same. The garage man noted that two wash basins would be the more presentable if sponged out, and conveyed the thought to the washer, who very promptly reminded him that he was hired to wash cars and not sponge out wash bowls. Rather than clean out the bowls he tossed up the \$36 a week job.*

land royalties to the Government in the form of crude oil, importation of oil and a scrupulous regard for carrying out the conservation provisions of the recently enacted oil-land leasing bill.

Local wholesale prices of gasoline were increased 2 cents last week. Gasoline sells here for 30 to 31 cents for ordinary motor fuel and 33 to 35 cents for refined gasoline.

### RENSTROM GETS ARIZONA TERRITORY

San Francisco, March 23—The Frank O. Renstrom Co. has been made one of the biggest distributors in the United States as the result of negotiations which have recently been completed by Mr. Renstrom. The company, which formerly was distributor in California and Nevada for Grant and Briscoe passenger cars, Atterbury trucks and Twin City tractors, has added Arizona to its territory and as a result now ranks with the greatest concerns of the kind in the western territory.

## Price of Motor Car Units Advance Steadily

### Engines Have Gone Up 22½ Per Cent and Tires Show 20 Per Cent Increase

Detroit, March 21—Prices of automobile units have been climbing steadily, and the crest apparently is not yet in sight. Engines have gone up 22½ per cent, frames 50 per cent, bodies 35 per cent, springs 25 per cent, and axles, clutches, wheels, top materials and tires have jumped from 20 to 35 per cent.

Nearly all of the tire companies joined in a 20 per cent increase last week, and the scarcity of cotton fabric is said to be such as to make a still further increase appear inevitable. The condition, according to tire men, is exactly the reverse of a year ago, when there was a rubber shortage. Today there is plenty of rubber, but little cotton.

Steel prices are fluctuating, but the trend appears upward, and automobile manufacturers are called upon to pay a premium for certain classes of steel that enter into the manufacturing of a car. Lumber, leather and other raw materials have jumped from 40 to 50 per cent within the last few months.

### SERVICE MAN ADVANCES

Philadelphia, March 18—F. A. Cornell, who was the first service manager of the Willys-Overland Co., and who has been prominent in the motor car industry for the last ten years, has been made vice-president of the Overland-Harper Co. Mr. Cornell comes to the Overland-Harper Co. direct from the Timken Roller Bearings Co., where he was manager of the department of machinery and industrial appliances, having charge of all sales outside of the automotive trades.

### PORTUGAL BARS MOTOR CARS

Paris, Feb. 20—The importation of passenger cars into Portugal has just been forbidden by the Portuguese government, and a limit has been placed on the number of trucks which can be taken into that country.

This decision will disturb principally French and American makers, who had orders in hand for Portugal. It is declared that French makers had received orders for automobiles to be delivered this year to the value of three million dollars and that a deposit had been paid on all these orders.

### AMERICAN PRODUCTION TO BE 2400

Atlanta, Ga., March 14—Announcement has been made by the American-Southern Motors Corp. of Greensboro, N. C., that the company's capacity the first year of its operation in the new plant at Greensboro, will be 2400 cars, and that the second year this capacity will be more than doubled, reaching 5000 American Balanced Sixes. The announcement was made to Southern investors of the corporation.



## Belgium Busy Repairing War-Wrecked Vehicles

**This Has Enabled Them to Keep Factories Busy and Build Dealer Organizations**

**B**RUSSELS, Belgium, March 5—Service and repair work have proved the salvation of the automotive industry in Belgium since the armistice was signed nearly eighteen months ago. This work has permitted the organization of factory forces and served to hold such organizations together and is now permitting dealers to organize their businesses until such time as they will be able to launch into the merchandising field. At present there is no such thing as selling motor vehicles, for none of the European makers have yet reached a production which would permit of anything like pre-war selling organizations.

Shortly after the armistice was signed it was decided to aid manufacturers to rebuild their factory forces by allotting them repair work on German and allied motor vehicles which had been left in the country by the armies. This served the dual purpose of enabling the manufacturers to build up organizations pending the time they would be able to restore their machinery for real manufacturing work and of giving employment to men skilled in this industry.

None of the motor car manufacturers in Belgium escaped scathless from the German invasion. In many cases the factories were totally destroyed or dismantled, while in all vital pieces of machinery had been removed to Germany and adapted there to war purposes. The German conquerors were not inclined to take any special care of the Belgium machinery, and even where this has been traced to where it was shipped in Germany, it had suffered so much from misuse that it required extensive repair or even entire replacement with new machinery.

There was only one place where such replacements could be secured—the United States—and even on the liberal credit terms

secured from American manufacturers of machinery, this meant that the Belgian automotive industry would be at a standstill at the most vital portion of the reconstruction period that immediately following the cessation of hostilities. Facing this situation, the authorities decided to apportion military machines to the various factories for repair, and this proved eminently satisfactory in enabling the makers to reconstruct their factory organizations.

At the present time such leading factories as Minerva, F.N., Metallurgique and Excelsior have so far recovered that they have given over the repair work and are now engaged in car construction. Other of the smaller factories, however,

### DES MOINES FORDSON PLANT READY

Detroit, March 21—Henry Ford and Son have begun operations in their tractor assembly plant at Des Moines, Iowa, and soon will be turning out 100 tractors a day at that plant. The only delay to scheduled production is in getting parts and materials, due in great measure to railroad congestion. With the Des Moines assembly plant in full operation the daily output of tractors will be increased to 550, the plant at St. Louis turning out 100 and the plant at Dearborn, Mich., 350.

## Cincinnati Shipping Cars by Water Route

**Southern Dealers Expected to Make Extensive Use of This Transportation Method**

**C**INCINNATI, O., March 21—With 210 automobiles shipped today and 1100 more in storage in this city awaiting shipment in the next few days, the transportation of automobiles to the South by water from Cincinnati, after being driven to this city under their own power, is beginning to reach such proportions as to attract the attention of Southern dealers.

That southern dealers will soon begin to make general use of the water route from Cincinnati was predicted by Thomas Brown, President of the Union Motor Company, Memphis, who with H. V. Neff, another Memphis dealer, were in Cincinnati today to superintend the shipments, which go to their companies.

Not only are the rates one-half the railroad rates, but there is only one-tenth of the trouble since the machines are shipped "set up" and ready for their new owners as soon as the barges reach their destinations, Mr. Brown said.

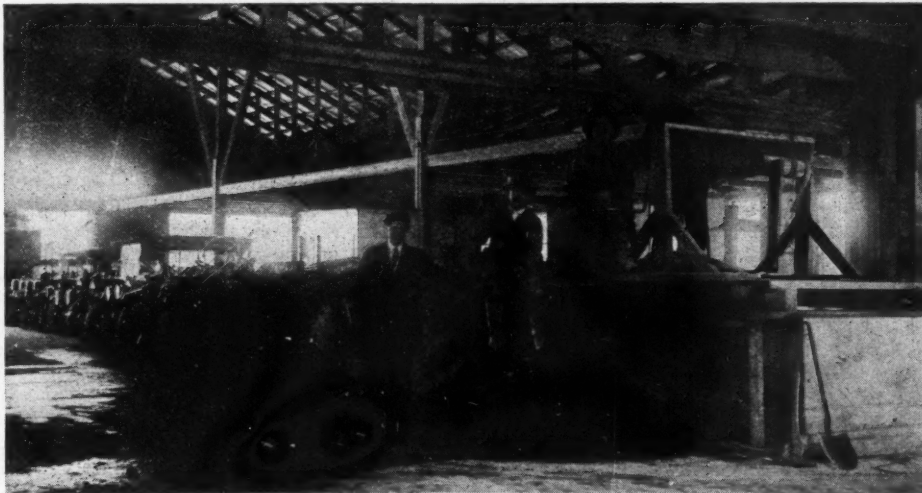
The cars shipped today were brought from Detroit under

their own power, badly travel stained and battered. They were sent to local automobile laundries and repair shops and then under their own power taken to the barges. With the emptying of their gasoline tanks and reservoirs they were ready for shipment, each barge holding from 50 to 60 machines.

When they arrive at their destination they will be filled with gasoline and water and driven direct to the homes of the customers, many of whom are expected to meet the barges at the wharves and drive their own cars home.

Even with the best of weather, the Memphis dealers expect to make regular use of this method of shipment, which will tend to relieve the shortage of freight cars, they said. The cars shipped and awaiting shipment are valued at \$2,400,000.

## Have You a Little Gold Mine in Your Garage?



**L**OS ANGELES, CALIF., March 21.—That a man should find a wonderful gold mine underneath his ordinary-looking garage is not impossible, as has been demonstrated in the case of A. B. Snyder, of Grass Valley, Nevada County, Calif. He has a garage that is a gold mine in the strictest sense of the term.

Some time ago while Mr. Snyder was excavating for a large underground gasoline tank at his garage, he uncovered a well-defined ledge of quartz at a depth of six feet. He decided to forget his garage business for the time being and to do some mining right inside of his garage. A windlass was installed, and a shaft sunk. In a short time some beautiful specimens of gold were ex-

tracted from beneath the garage floor. The shaft was sunk to a depth of 60 feet, and so much water was encountered that an electric pump was installed.

During the mining operations several tons of gold quartz were taken out of the shafts and drifts under the garage. This quartz was crushed and milled in a nearby stampmill. The quartz gave returns of \$137.50 per ton.

After the mine had been worked for a short time the waste dirt taken out accumulated in a large pile that extended the full length of the floor inside of the building, leaving but little room for automobiles. The Golden Center Mining Company bought the mineral rights under the garage and are working it.

## Los Angeles Not to Hold Any Spring Exhibition

**Dealers Decide Against Show But May Hold Display Later in the Year**

LOS ANGELES, March 21—The Motor Car Dealers' association has decided definitely against holding a show here this spring or summer. The subject has been left open to the extent that the action does not mean there will be no show this year as it is very probable one will be held in the fall. This will be determined by conditions at that time.

Two reasons assigned by the association for its decision are inability to obtain a building sufficiently large to accommodate the right sort of show and the car shortage that now prevails. There are some members of the association who favored a show at this time, but they are very much in the minority.

Shows are regarded here as in the nature of business boosters. With practically every dealer behind in deliveries there is no stimulus needed for business. Some dealers are taking orders to-day for delivery six months hence. Immediate delivery, except in very rare instances, is unknown. Last year the association expended \$75,000 to put on a show at a time when something was needed to stimulate buying. It was the first after-the-war show in the country and proved a very profitable investment at that time.

There is no available building in Los Angeles big enough to house an automobile show. It is believed that by fall such a structure will have been erected. For several years past the shows have been held in tents. This would indicate there would have been a way to solve the housing problem had the dealers really been keen for an exhibit.

With the association passing up the show, it now seems as if an effort will be made to put on an "outlaw" event. Such a show is now being arranged for, but it will be limited to trucks and accessories. Nearly all of the prominent truck concerns are members of the association, so the success the contemplated show will meet is very problematical. It may go over good and again it may be a dismal failure.

### OWENSBORO TO HOLD SHOW

Owensboro, Ky., March 21—April 1, 2 and 3 have been selected as the dates for the annual Owensboro Automobile Show which is to be held in the Davies County Loose Leaf Warehouse. It is expected that the entire building will be filled with exhibits.

### FT. WORTH SETS SHOW DATES

Ft. Worth, Tex., March 21—Ft. Worth has set April 12 to 17 as the dates for its annual automobile show this year. The show will be held in the Winfield Garage and the Subb Diggs Annex, the passen-

ger cars taking up the two floors in the former building and the trucks in the latter. The two show buildings have a total of 40,000 sq. ft. of floor space. So far, 116 passenger car and truck exhibits have been nominated for the show.

A special feature of the show will be the automotive vehicles particularly adapted for operations in the oil fields of Texas and Oklahoma.

### LAW HITS OREGON GARAGES

Portland, Ore., March 21—A city ordinance passed two years ago, prohibiting storage of five or more "live" automobiles in a frame building at one time, became effective here March 13. From 15 to 20 garage and repair shops are affected by the new law, most of these being in the upper Alder street district on the west side. By action of the city council, extensions of 90 days have been granted three concerns, due to delay in construction of new buildings.

According to Fire Marshal Edward Grenfell, garages and repair shops of Portland are 100 per cent better fire risks now than a year ago. He attributes this not only to improvement in

*Phildelphia, March 21.—As a publicity feature, Herbert Bros., Chandler and Cleveland distributors in this territory, have prepared to issue to customers a vest-pocket booklet covering police traffic regulations for Philadelphia, covering every phase of a driver's liability, as well as the new State laws on automobile lights and a schedule of parking places and hours.*

the class of garage structures, but to preventive practices of the operators, who have awakened to the necessity of precautionary measures as a part of garage routine.

Hereafter new garages built in Portland will be required to have adequate heating facilities, and old ones will be expected to install such equipment. This arises from discomforts caused by the anti-stove ordinance in a most unusual cold spell for this climate last December and January.

### TEXAS FACES 35-CENT GASOLINE

San Antonio, Tex., March 23—A threat of 35 cent gasoline has set the San Antonio Automobile Trades' association buzzing like a hive of angry bees. Somebody is likely to be stung, but it will not be automobile dealers of San Antonio if the association can prevent it. A special meeting of the association has been called at the Hotel Gunter by President W. A. Williamson and more than fifty members indignantly discussed the situation.

Three weeks ago gas in San Antonio was 20 cents a gallon. To-day it is 28 cents, and a raise to 35 cents is said to be imminent. In comparison with contemporary prices of but 24 cents at Tulsa and other southwestern points the San Antonio price is regarded as unwarranted by the local dealers. They want to know why, and know quick.

## Apply for Sanction for Elgin Road Races

**Classic Will Be Staged Latter Part of August According to Present Plans of Officials**

CHICAGO, March 15—Application for sanction for the 1920 Elgin road race has been made to the contest board of the American Automobile Association by Charles P. Root, chairman of the contest committee of the Chicago Automobile Club, which with the Elgin Road Race Association will conduct the classic.

If the A. A. A. chairman grants permission the race will be a national championship affair, at least a factor in determining the champion for the year. Under this condition the race will be for the new size racing cars, 183 cu. in. piston displacement, such as will be used at the 500-mile race at Indianapolis Decoration day. The distance will be approximately 250 miles and \$15,000 will be put up for the competing drivers.

There is a plan to limit the number of entries to thirty-two, to assure the cream of talent, including the foreign pilots who will compete at Indianapolis.

Saturday, August 21, has been selected as a tentative date, which will sandwich between the July 4 and Labor day meets throughout the country and will precede the starting of the big Glidden tour scheduled to occur about September 1.

While the road is still soft from spring rains it will be scarified, harrowed fine and then dragged after each rain to make it as smooth as a track. A short time prior to the race it will be again dragged and oiled and the 1920 race should, even with the smaller cars, put up a record that will exceed that made in any previous road event in this country.

### YORK, PA., STAGES DISPLAY

York, Pa., March 20—With a good attendance the York County Automobile Dealers' association's annual show of passenger cars and commercial vehicles opened, the former in the Overland-Harrisburg Co.'s garage and the latter in the Snyder Auto Co.'s building.

### VANCOUVER TO HOLD EXHIBIT

Vancouver, B. C., March 20—Arrangements have been entered into between the Canadian Exhibition Board and the British Columbia Motor Trades' association which assure a show being held here this year. The dates of the exhibition have not yet been decided.

### OVERLAND PLANS 800 OUTPUT

Toledo, O., March 19—Willys-Overland Co. is planning a daily production of 800 cars, upon the approval of the new financing program to be voted on by the stockholders March 24. The schedule is almost double the daily record for January, and is about 300 more than the output schedule for 1920.



# New England Service Work Shows Considerable Betterment

## Gathering of Dealers at Boston Show Indicates a Vast Improvement in this Department of Motor Car Industry



Boston was forced to use two buildings for its motor car show this year. Below is a view of the main display at Mechanics Hall while above is the "overflow" exhibit at the Armory where cars and trucks were shown together.



**B**OSTON, March 17—Show week finds Boston remaking automobile history. The Boston show has always been one of the season's big expositions and this year it is more than living up to tradition. The show itself is staged in two buildings, Mechanics hall having proved too small to accommodate Boston distributors and dealers of ninety makes of cars and sixty-nine of trucks who wanted to show their products. Every nook and corner of the hall is utilized for cars, trucks and automotive equipment and in the South Armory nearby, there is an overflow show under the same management with all classes of automotive products on the same floor. As it is, 117 would-be exhibitors did not get into the exposition because they applied too late or space was lacking. Among these are five dealers in cars and trucks.

### Capacity Crowds Attend

As in past years, the show is drawing capacity crowds. In fact, it is this condition which makes the armory show at least a possible success, for the crowds go there only when Mechanics Hall is so crowded that it is next to impossible to view the exhibits. Trucks, shown in the basement of Mechanics hall and on the Armory floor, are commanding attention because of their proximity to cars and sales and promotion results have been good since the opening last Saturday. As for cars, the demand in the New England territory is estimated at three times the year's allotment, so that the show largely is selling for the future.

Gathering of 1900 territorial dealers



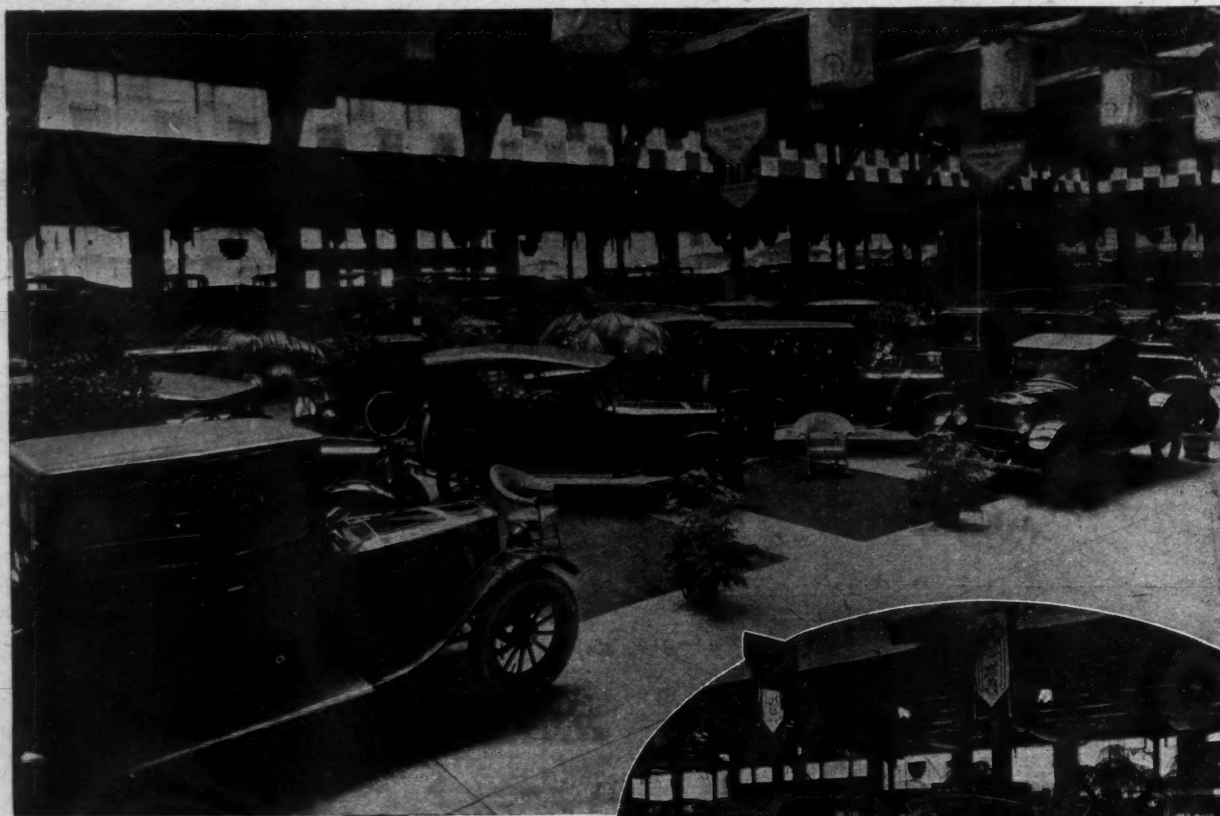
here during the week reveals a notable improvement not only in sales but in service facilities throughout New England. In Boston the big dealers are in the midst of an expansion of service accommodations which is really phenomenal. Approximately \$3,000,000 worth of new buildings have just been completed or are in course of erection for automotive houses and a fair proportion of this investment is going into the service field. The Henshaw Motor Co., handling the Dodge, has just moved into its new establishment in which separate buildings, half a mile apart, are used for sales and service. Service is being handled as an institution in itself with selling and mechanical departments co-operatively, yet independently managed. The Boston Buick Co., which is about to move into a new home, has engaged the head of

the motor section of the Boston Fire Department as service manager and will work out some important developments of service work. Similar extension of service activities is being undertaken by several large Boston distributors.

### Improve Service Facilities

Out in the New England territory as well, there is a noticeable improvement of service facilities under way. New plants have recently been opened in several of the cities and larger towns. The small town dealer is participating in the awakening. Repair shops, which were hardly worthy of the name, are being succeeded by modern garages in many small communities. There are fewer hardware and farm implement dealers selling cars and letting the owners depend on the larger town dealers for

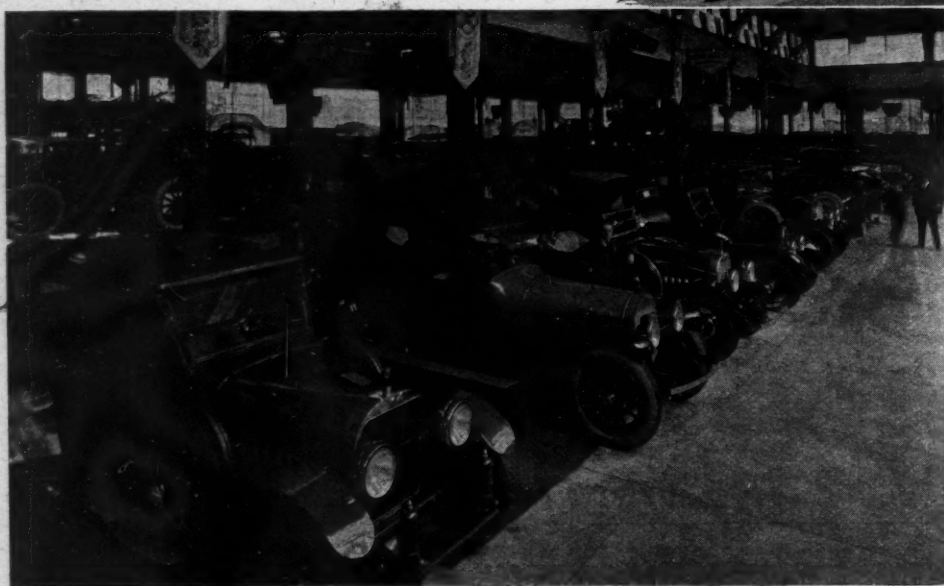
# Indianapolis Has a Spacious Car Exhibit



A general view of the Indianapolis motor car show. This photograph conveys the atmosphere of spaciousness which made the Hoosier exhibit notable



Above, the display of the Nordyke & Marmon Co., one of the prettiest at the show; left, the display of the Updike Auto Co., comprising models of the McFarlan, Locomobile and Daniels cars



service than there used to be here.

There is a noticeable increase in the number of implement men going into the motor car business and a number of those taking this step are preparing for service along with sales. In the truck field, small town car dealers are not as active as the larger community men in taking advantage of the opportunity for profits in this rapidly expanding business, and truck service outside

of the large centers is even less aggressive than sales. In fact, except in the case of light trucks, the territorial distributors are still handling the details of truck service.

## Educating Small Dealers

The Boston distributors are using traveling representatives quite extensively to educate small town dealers in truck sales and car and truck service,

and the general outlook is encouraging.

Tractors, so far, have made little headway in New England, Fordson and Cletrac have made some impression in the Maine potato country, Fordson is getting into the Connecticut Valley and Cletrac has been installed to quite an extent in the Southern New England industrial centers. Five or six other makes are being sold in Boston, two or three by newly organized firms,



**LIMIT TRUCKS ON DIXIE HIGHWAY**

Monroe, Mich., March 20—County road commissioners following an order of the supervisors have issued a ruling, prohibiting automobile trucks, carrying more than 15 tons, from traveling on the Dixie Highway. The order went into effect today, and two special deputy sheriffs have been assigned to patrol the highway and arrest offenders.

**INCREASE CANADIAN RISK RATES**

Toronto, Ont., March 21—As a result of experience in the last few years, important changes have been made in the method of rating as well as in the rate charges for various classes of automobile insurance. This decision was arrived at a recent meeting of the Canadian Automobile Underwriters' association, and the new system follows that which has been in force in the United States.

The rules and rates became effective March 1 of this year. Some of the outstanding changes include a material increase in theft rates, which are now classified according to the make of the car and not the price as formerly. For instance, the theft rates on new Fords, Overland and Chevrolets is \$3.25, McLaughlins, \$2.25, Studebaker, \$1.50, and Pierce-Arrow, 40c per \$100 insurance carried. Thus cars most popular with thieves have a higher rate for theft. Again the \$25 deductible clause in collision assurance has been eliminated and \$50 deductible has been substituted.

The rate on commercial cars also

has been greatly simplified. Instead of seven classifications according to industrial occupations, there are now only three groups with a resulting tendency of lower rates on certain classes. Cars used for pleasure purposes only are subject to 10 per cent reduction on liability and property damage.

**KENDALL NEW PRODUCTION HEAD**

Sidney, Ohio, March 22—R. V. Kendall has been appointed vice-president in charge of production for the Mull Wood Work Co. mfr's of steering wheels.

**Official Figures Issued on the Gasoline Situation****Bureau of Mines Shows Conditions Now Are Considerably Better Than a Year Ago**

WASHINGTON, March 18—In view of the alarming reports of a shortage of gasoline and crude oil and the predictions of officials in the oil industry that gasoline will increase to as high as 35 cents per gallon shortly, figures just made public by the Bureau of Mines, Department of the Interior, are particu-

against 15,749,771 bbls. on Dec. 31, 1918 and 11,638,433 bbls. on Dec. 31, 1917. This shortage is particularly noticeable in view of the fact that the production of crude oil has increased steadily with 1,046,052 bbls. per day in December, 1919, as compared with 869,618 bbls. per day in December, 1918, and 811,484 bbls. in December, 1917.

**MANUFACTURER CANNOT FIX RETAIL PRICE**

Washington, March 22—The case of A. Schraders Sons, Inv., charged with violation of the Sherman anti-trust act was referred back to the Northern

District Court of Ohio yesterday by Supreme Court of United States for further action. The Supreme Court failed to sustain the demurrer granted by the Northern District Court, in which that Court found Schraders were not entered into licensed agreements, but rather in selling agreements with tire makers and jobbers, comparing the case with one in which Colgate & Co. were involved, where the Supreme Court found it was not a violation of the Sherman Act for manufacturers to inform their customers of their desire for price maintenance. In Schraders' case the Supreme Court found there was no comparison with the case of Colgate & Co., and declared that there is a distinct difference between the manufacturer who displays a desire for price maintenance by request and one who maintains

prices by obligatory agreements. The Supreme Court therefore reversed and remanded the demurrer. This does not mean that A. Schraders Sons, Inc., has been found guilty of violating the Sherman Act, but merely that the Supreme Court has refused to recognize its claim as set forth in the demurrer.

**COAL SHUTS DOWN ACME TRUCK**

Cadillac, Mich., March 21—Coal shortage compelled the Acme Truck Co. to lay off most of its factory force several days last week, and other factories are working reduced schedules.

**Motor Truck Production for February**

Truck	Estimate for 1920	February
Acason .....	900	75
Acme .....	2,500	119
All-Power (X) .....	.....	.....
Columbia .....	750	8
Commerce .....	5,000	300
Denby .....	3,600	90
Duplex .....	3,000	55
Federal .....	6,500	406
Ford .....	150,000	12,000
G. M. C. ....	20,500	800
Hall .....	1,200	25
Jackson .....	350	28
Jumbo .....	1,500	68
Kalamazoo .....	1,000	30
Maxwell .....	.....	800
Menominee .....	No schedule	15
Napoleon .....	2,000	48
Oldsmobile .....	20,000	1,411
Olson .....	2,000	140
Packard .....	10,000	750
Paige .....	2,800	70
Power .....	712	1
Reo .....	25,000	1,650
Republic .....	20,000	1,500
Signal .....	1,000	54
Standard .....	1,500	125
Tower .....	750	56
Transport .....	4,000	335
Triangle .....	800	28
Union .....	3,000	60
Wolverine .....	600	40
<b>Total .....</b>	<b>292,062</b>	<b>21,152</b>

X—Just getting into production.

larly important. These show that the situation as regards gasoline is considerably better now than a year ago. A total of 446,793,431 gal. of gasoline are on hand at the refineries as of Dec. 31, 1919, as compared with 297,326,983 gal. in 1918 and 412,256,833 gal. in 1917, displaying a recovery from the war-time conditions.

Crude oil shows an alarming decrease in the stocks on hand and especially so in view of the fact that production has increased steadily during the last few years. The crude oil on hand as of Dec. 31, 1919, is 13,143,285 bbls. as

## Stop Salesroom on Residence Street

NEW ORLEANS, La., March 23—The effort of the Abbott Automobile Co., Ltd., to erect at the corner of Napoleon and St. Charles avenues, a \$200,000 structure to house its offices and salesroom, has been at least temporarily halted by the application of an association of residents along St. Charles avenue for an injunction to prevent the building of this or any other kind of commercial building on St. Charles avenue, or for a certain distance on either side of it, on side streets. The trustees of the Napoleon Avenue Presbyterian Church also are joining with the residents of the avenue in seeking this injunction. Ginder Abbott, president of the Abbott company, a \$100,000 concern, and the largest auto-selling corporation in New Orleans said:

"In determining to erect a \$200,000 plant to house our salesrooms and offices on this location, far out in the city's best residence district, we were guided to a considerable extent by the fact that many successful dealers in high-grade cars throughout the country have found it desirable to break away from the retail business districts of the cities. The building is of classical architecture and has more the appearance of a courthouse or a public library than of the usual automobile dealer's office, and the automobile business now days is of an entirely different nature from the general retail business along other lines. We have decided to make our new home one of the most attractive buildings in the city, and, in addition to erecting a handsome structure, we will surround it with wide lawns and decorative fountains. It will really be a beauty spot on St. Charles Avenue, and will in no way detract from the general beauty of the residences thereon.

"The salesroom proper will be 150 ft. long by 50 ft. deep, with a ceiling 25 ft. high, making a room somewhat larger than the main hall in the Carnegie Library in New Orleans. The entrances and exits for autos will be on the back streets and none will enter or leave the building through St. Charles avenue."

### WISCONSIN ROADS MEN ELECT OFFICERS

Milwaukee, Wis. March 22—The Good Roads Association of Wisconsin, at its annual meeting at Madison, elected C. C. Jacobus, member of the Milwaukee county board of supervisors, as president. Elmer S. Hall, Green Bay, was elected vice-president; E. J. Perry, Fond du Lac, treasurer; William H. Reese, sales manager Sterling Truck Co., Milwaukee, secretary. Francis A. Cannon was reappointed executive secretary and manager. As customary, the association held its annual convention at the same time as the yearly "good roads school" conducted by the Wisconsin State Highway Commission for county highway commissioners and their subordinates. The county commissioners maintain a distinct organiza-

tion, which co-operates thoroughly with the commission as well as the general road association.

### URGE WIDE DOORS ON CARS

New York, March 19—In the current bulletin to its members, the National Automobile Chamber of Commerce advises automobile manufacturers and dealers to insist that the railroads serve them provide wide door openings when building or repairing box cars. This need was brought to the attention of the railroad administration at the traffic meeting of the Chamber held in Detroit, Jan. 29. This also will be brought to the attention of all the lines independently and it is believed that the large volume which automobile traffic has attained (300,000 carloads in 1919) and the amount of business lost to the carriers through lack of cars and consequent driveways (40,000 carloads in 1919) will add considerable force to the request.

The N. A. C. C. Bulletin says: "Members and their dealers should urge this point continuously on all railroad officials and employees with whom they come in contact."

The railroad administration was also urged to relieve the critical shipping conditions. The effect on labor and

business of such conditions in the automobile and allied industries was emphasized, as was also the great loss of revenue to carriers through the driving of thousands of carloads of automobiles over the roads instead of shipping them by freight. Particular stress was placed on making directors of the western and southwestern regions realize the importance of returning automobile cars to the manufacturing territory.

### NEW DENVER TRUCK DISTRIBUTOR APPOINTED

Denver, Colo., March 20—Contracts for the distribution of about \$750,000 worth of trucks have been signed by the Standard Motor Sales Co., Inc., recently appointed distributors for the Standard Motor Truck in Colorado and surrounding states. W. S. C. Smith is president and A. J. Patterson vice-president.

### CORRECTING AN ADVERTISING ERROR

In our issue of February 5, the advertisement of the Edwards Sales Co., Chicago, contained this statement relative to the Johnson Universal Tire Lock.

"Protect your spare tires with a Johnson, and save \$15.00 plus 5 per cent insurance."

The Edwards Sales Co. wish to say that this statement was not correct, and states the lock brings only the usual 5 per cent theft-insurance premiums.

## 24,000 Motor Vehicles for Roads

WASHINGTON, March 20—To date, the War Department has turned over to the United States Department of Agriculture approximately 24,000 motor vehicles, as provided in Congressional legislation empowering the latter department to distribute this war material among the State Highway Commissioners for use in road building, allotments of the vehicles to be based on the amount of Federal-aid for roads which the states receive. This is practically all the vehicles which the War Department has to release. Of this total 12,000 have been delivered to the states. The remainder will be distributed as fast as railway cars can be secured for their transportation. Representatives of the Bureau of Public Roads, in charge of the matter, believe that within two or three months all of the vehicles will have been delivered to the States. This equipment promises to be a great aid in carrying out the large road building program for 1920.

The State highway commissioners are also interested in securing allotments of tractors, steam shovels, locomotive cranes, automotive cranes, industrial railway track, dump cars and industrial locomotives which remain to be disposed of by the War Department. A measure known as the Kahn bill, directing the Secretary of War to release this material for the State highway commissioners, has passed the Senate and has been reported out of committee in the House. Until the Secretary of War has

been directed by Congress to turn over this equipment it is not likely that it will be available for State distribution.

### AUSTIN TO BUILD IN AMERICA

Buffalo, March 19—Following the example of Dunlop American, Inc., which will soon begin the erection of a \$25,000,000 tire plant in Buffalo, the Austin Automobile Co., Ltd., of Birmingham, England, will build an American factory in the outskirts of Buffalo, it was announced here this week.

The Austin Corp., one of the largest British automobile manufacturing concerns, reached a decision to establish its plant in Buffalo after eleven months of survey of American industrial cities, according to the announcement made here, and believed to be made upon unquestioned authority. Two sites are said to be under consideration, one in Bailey avenue and the other within a short distance of the Dunlop tire plant site.

### TO TEACH SERVICE WORK IN ARMY SCHOOL

Atlanta, Ga. March 23—What is said to be the largest school of its kind in the United States Army has been established at Camp Jesup, Ga., in the suburbs of Atlanta, known as the Camp Jesup Motor Transport School. While the maximum attendance of 900 students and 100 instructors was not reached at the opening last Saturday it is expected that the quota will be reached within the next ten



days. There were 630 military students enrolled on the first day with 85 instructors.

Sixteen courses are included in the school work, averaging fifteen weeks each to complete them. Approximately 150,000 sq. ft. of floor space has been turned over to the school along with \$1,000,000 worth of equipment for its exclusive use. In addition to the instruction work it is planned to overhaul and rebuild some fifteen motor trucks and twenty motorcycles each month in the school.

There is a similar school at Camp Holabird, Md., and two others are to be opened at San Antonio and El Paso, Texas. It is the plan of the War Department to train real mechanics not only for the present needs of the Motor Transport Corps, but to build up a reserve that could be called into immediate service in time of war. Those men who have exceptionally high ratings will be offered academic courses in the technical schools and others will be made assistant instructors in the transport schools.

#### STEWART TRUCK PRICES ADVANCED

Buffalo March 20—New prices for all models of Stewart trucks were announced this week by the Stewart Motor Corp. as follows:  $\frac{3}{4}$ -ton chassis, \$1350; 1-ton chassis, \$1655;  $1\frac{1}{2}$ -ton chassis, \$2250; 2-ton chassis, \$2875, and  $3\frac{1}{2}$ -ton chassis, \$3895.

## To Remedy Los Angeles Traffic

LOS ANGELES, March 20—On the premise that the business district of the city must be made a no-parking zone for automobiles, owing to the traffic stagnation incident thereto, or that the street railway company must be permitted to reroute cars and advance the fares the Railway Commission of California is waging a strenuous battle with the City Council and it looks as if the latter will recede from the struggle by putting all responsibility upon the commission.

For more than a year traffic conditions in Los Angeles have been intolerable. Automobiles have been permitted to park alongside the curbs for a limited time so that they line both sides of the streets to a point within about 50 feet of the intersections. In placing cars at the curb or in getting away from the curb drivers of automobiles have brought about constant blockades of the street cars. The general public has been making a protest and at last the railway commission took the situation in hand when the city council appeared unwilling to provide a solution.

Business interests in the downtown district made the complaint that if motorists were not permitted to park their cars there would be a loss in trade. The street railway company claimed that it could not maintain the service the public demanded because of congestion due to automobiles. The commission has assumed the attitude that the num-

## Texas Light Law Unconstitutional

AUSTIN, Tex., March 19—The law passed by the last legislature making it unlawful to use glaring and brilliant automobile headlights is inoperative and unenforceable, according to a decision just rendered by the State Court of Criminal Appeals in the case of J. H. Griffin, an appeal from Tarrant county. The case against Griffin was dismissed. The court, however, said that its status is commendable in purpose; that "it strikes at an annoying evil."

The validity of the statute as creating an offense was assailed. The law prohibits the use on automobiles of lights of such glare and brilliancy as to seriously interfere with the sight of or temporarily blind the vision of the driver of a vehicle approaching from the opposite direction. Penalty is provided for. Opinion was expressed by the court that the act is not sufficiently definite, and it is stated that the law requires certain degrees of definiteness in denouncing acts as criminal.

The criticism of appellant that he can not conceive how a crime can on any sound principle be defined in so vague a fashion, is a just one, held the court.

"The statute is so framed as to be obnoxious to rule which requires some degree of certainty in informing one accused of crime of the nature of the accusation against him to which he is

entitled under article I, section 10 of the constitution," says the court's opinion. "In the statute glare and brilliancy denounced as criminal are such as to seriously interfere with the sight or temporarily blind the vision of the driver. What degree of interference is serious is a matter not fixed by the legislature; the glare and brilliancy are not described by any standard that is certain, that may be known in advance by the citizen, nor is there by the legislature any rule fixed for deciding at what point they reached the prohibited degree of brilliancy; whether the act be criminal or lawful is made to depend largely upon the peculiarities that may affect the vision of the driver of the approaching vehicle."

#### TO ESTABLISH SERVICE STATION STRING

Indianapolis, March 20—The Bales Manufacturing Co., makers of the Bales Puncture Plugger and other products has been reorganized with the view of selling the plugger and other products through the Bales Service Stations, which are to be established over the country, according to the announced plans. These service stations will sell everything used by the motorists. A factory has been established in Indianapolis. The executive offices are in the Lemke building.

The officials are: Edgar L. Bales, president; E. W. Steinhart, vice-president; W. A. Smith, vice-president; N. W. Irwin, vice-president; J. W. Fudge, vice-president; B. M. Wylie, treasurer and Dana O. Fesler, secretary. Gwynn F. Patterson, E. H. Hardin, H. R. Coulthard and C. W. Smalley are directors. The promoters of this company are men well known in the motor car and accessory business in Indiana. Dr. H. A. Barnard, Indiana pure food commissioner, is consulting chemist and Wm. A. McAbeel, state chemist, chief chemist.

#### BLACK & DECKER OPEN CHICAGO OFFICE

Chicago, March 18—Permanent offices and salesrooms have been opened in Chicago by the Black & Decker Mfg. Co., manufacturers of service shop equipment and automobile machinery. The new office is in charge of R. G. Ames, whose territory has been extended to cover the entire middle west.

#### COURTESY PAYS OUT HERE

Emporia, Kan., March 19—F. E. Pennington, manager for the White Eagle Oil and Gasoline Co., believes in making the tourist's way as easy as possible. He has erected a signboard on the front of his largest filling station giving distances and road directions between the town on all the principal highways of the vicinity. He declares he has been more than repaid for his expenditure by the increased amount of business he has gained through this courtesy.

#### RUTENBER MOTORS SOLD

Chicago, March 22—A deal has been consummated whereby the Indiana Truck Corp., Marion, Ind., has taken over the Rutenber Motor Co., models 38 and 40, and will produce these engines for its own use. Rumors have been in circulation regarding the sales of the Rutenber properties, but the Indiana truck announcement is the first confirmation of these reports.

#### BIG ATLANTA GARAGE BURNED

Atlanta, Ga., March 6—The Piedmont Garage, one of the largest garages in Atlanta, was entirely destroyed by fire early Sunday morning. The building was four stories in height, the upper floors being devoted to the storage of motor trucks owned by the government and used by the Atlanta Postoffice Department. Nineteen government owned trucks were destroyed and several other trucks stored in the building by Atlanta business houses.

## Can I Afford It?

(Continued from page 9)

are pretty well tooled up when it comes to the smaller pieces of apparatus. It is in machine tool equipment that many repair shops are weak. Every shop does not need a lathe, perhaps, but a lathe is a mighty handy thing at times. A drill press is a valuable asset and so is a power grinder.

There is just this much about putting in shop equipment. If you have a shop well tooled up to handle efficiently all classes of work you then can let your whole community know about it and before you know it every machine you thought would be a liability will prove an asset. Machines are a liability when they stand idle and the trick is to see to it that they are in use all the time.

Even if we grant that the small dealer does not stock up with expensive machinery, there still remains certain other pieces of apparatus he should have to turn out good work with mediocre mechanics or a shortage of men. Under this class of equipment come devices like piston aligning jigs, engine stands, straightening presses, portable benches, axle stands, etc.

Why an engine stand, or an axle stand? Simply because your men cannot do efficient work when they cannot get at the parts easily or cannot see what is going on. With an engine stand all parts are convenient to get at and the work always can be placed to get the best light. Engine stands conserve the mechanic's energy and besides he can handle the job alone at all times, because so far as getting the engine on the stand or taking it off, a chain fall does the work.

Portable benches save the mechanic's time trotting back and forth to the sta-

tionary bench for the vise or for other work. And while repair work on the quick service floor is not generally to be desired, still there are times when it is convenient to do so and here again the portable bench comes handy.

After all a stationary bench becomes so much shelf room in the shop and it is surprising to see how little use you will have for one if your shop is equipped with a few good portable benches. The removal of stationary benches will give you just that much more room in the shop.

Piston aligning devices instantly will tell whether or not a piston is going to run straight in the cylinder and also whether or not the piston is running at right angles to the crankshaft. It is easier to detect faults of piston misalignment before the engine is assembled than to have an owner drive in later on with his cylinder scored as a result of poor work. It's better to know that the job has gone together right than to

have to do it over the second time.

Straightening presses, arbor presses and such like nowadays take the place of the sledge and anvil. Take the illustration showing a mechanic straightening a front axle in a press. In the old days this would have required a forge or fire of some kind to heat the job, an anvil or swage block, sledges, tongs, two men and perhaps a few other items. As it is one man does the job without great effort and without beating the axle.

### SHALL WE DIVIDE SERVICE?

(Continued from page 16)

trained mechanic, to make repairs and adjustments. The damage to a truck is considerable unless repairs are attended to at once."

Z. S. Vertner, Z. S. Vertner Motor Sales Co.—"Passenger cars and trucks are such an entirely different proposition that they should be serviced, when possible, in separate buildings.

"In the first place, service doesn't mean something for nothing in the case of a truck or passenger car, any more than it does in a hotel. You expect and demand real service there and when you get it, you pay the price uncomplainingly for what you have had.

## Where Minute Man Service Obtains

(Continued from page 12)

Date, shipping order, tag number, factory. Adjustment—Date, charged, repaired, credited (one of these entries to be checked to indicate which), amount. Final Adjustment—Charge or credit, customer or account, amount. Remarks. Also: Date, requisition number, name, parts replaced, showing number, and name; charged from and to; cost price, and sales price.

Under the heading "Defective Parts Not Adjusted" are the following entries: Month ending; page number; charged to; parts sales or shop order number; amount; shipping order; tag number; factory; service department report, checked on ledger.

When parts are shipped back to the factory, however, there is another supplementary process. This entails the use of a Shipping Order for Returned Parts, which is made out in triplicate, blue, white and pink. This form is the same size as the shop order. Two of these forms are shipping order and duplicate, the latter being held by the clerk, while the third copy becomes the packing slip. This is the pink one, having at the bottom the caution: "In case of error, please return this slip." The shipping order is used by the manager as the basis for his correspondence with the factory for adjustment; the clerk holds a copy as already mentioned and the third copy, or packing slip, is returned to the factory with the part.

The special form for emergency calls is not only a record in full of the call itself and what it has necessitated, but it also constitutes the company's insurance report and in this way is doubly valuable.

This form is used in case of a street

accident. It is the same size as the shop order and is made out in duplicate, white and blue copies, the disposition being the same as the shop order—one copy retained in the service department and one going to the manager's office.

Before the customer takes away his car after a repair job, the foreman takes it over for final inspection in the customer's presence, reviewing and explaining the work.

### Emergency Service Car

The company has a "speed wagon" of 1-ton capacity as a service car, equipped with block and tackle, towing chain, jacks and small tools usually carried for emergencies. Inspections of fleets and individual trucks are made with this car.

In the shop, among the principal equipment units, are the following, which, together, are valued at about \$4000; permanent drill press with back gear drill; double column grinder; heavy-duty, 50-ton arbor press; 20-in. lathe; power-saw; power-shaper; rivet grinder; heavy-duty line reamers for camshaft bearings and a heavy-duty, water-cooled air compressor, piped parallel with gas, through the building. This last-mentioned machine is found especially useful for reboring cylinder blocks. Virtually all riveting and drilling are done in the Brockway shop in Philadelphia by air.

### SEVERIN SIX WHEELBASE 122½ IN.

The wheelbase of the Severin Six is 122½ in. and not 122 in. as stated on page thirty-one of our March 18 issue, through a typographical error. The tires used are 32x4½ in.

## ONLY TWO FORMS IN THIS SERVICE SYSTEM

(Continued from page 18)

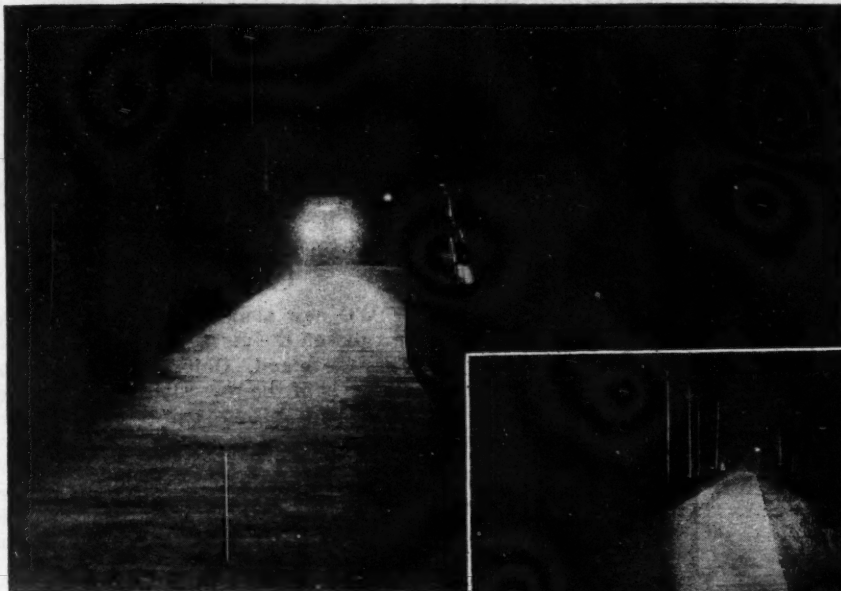
a small garage with a stripped gear. The garageman removes the shaft and proceeds to knock off the broken gear with a cold chisel. He may bang up the shaft a little in the process but eventually he gets it off. If he happens to have on hand the spare parts that are required the owner is lucky; otherwise the car will stand useless until the parts arrive from the factory.

Witness how the thing is done in the Northway establishment: A quick diagnosis is made of the case by the service manager and the car is immediately shot upstairs to the repair room. The job is turned over to the transmission man, the shaft quickly taken out, placed in an arbor machine, and the broken gear is removed without damage to the shaft. Northway makes certain to have the needed spare part in stock, because he will not accept repair work on cars for which he does not hold the agency, so there is no long wait on the part of the customer while the spare part is coming from the factory.



# New Anti-Glare Headlight

Two-Way Lamp Tilts Downward by Novel Method of Control

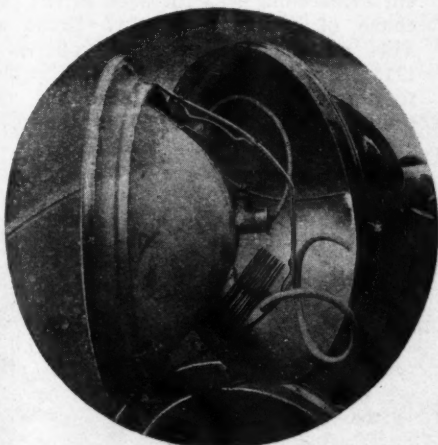


The camera's proof that no blinding rays are given by the Two-Way Lamps in the deflected position

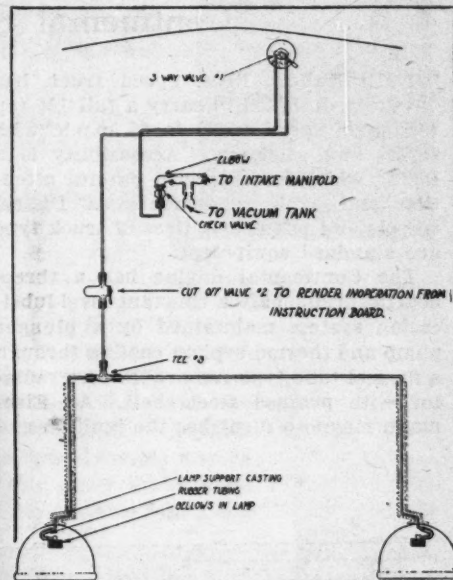
THE Two-Way headlight is an advanced development in lamp design to prevent the usual glare, and still maintain sufficient light to insure safety. The question of how to eliminate glare and still retain proper illumination of the road has been a serious problem for a long time and various methods have been tried out, all of which have resulted in creating a disadvantage to offset each advantage gained.



Showing the illumination for a long distance down the road with the Two-Way Lamps in the elevated position



This view shows the metallic bellows (the bellows looks like a coil spring in this picture, and is just back of the center of the reflector and slightly below) in its extended position. In this position, the bellows pushes the reflector forward at the top, giving the focal point of the lamp a deflection of five degrees. This is what happens with control lever at "L"

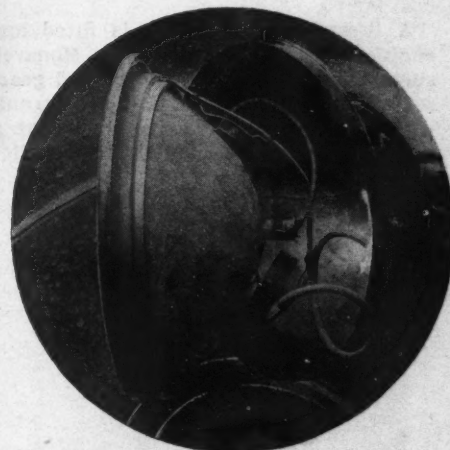


Two-Way Lamp Diagram

entirely of metal, which when the air is exhausted from it, pulls the top of the reflector backward 21-32 in. causing a deflection of the light beam of 5 deg. downward when the reflector is placed in the lamp to swing on a horizontal axis. A study of the illustrations at the bottom of the page will place all the parts clearly in mind and show the principle of operation.

The operation of the reflector is controlled by a small three-way valve located on the dash as shown in the instal-

(Continued on page 41)



This view shows the metallic bellows (the bellows looks only about half as "thick" in this picture as in the one to the left) in its contracted position. By turning the control to "H," the vacuum created by the action of the pistons deflated the bellows and pulls the reflector back at the top, giving the focal point of the lamp an elevation of five degrees

The two-way light principle which is to control the rays of light by tilting the reflector has been used by two automobile companies and has proven highly satisfactory. The method of control of the reflector in the Two-Way Lamp is a new and interesting achievement of the Indiana Lamp Co., Connorsville, Ind., and is characterized by its simplicity and reliability.

The unit consists in main, of a ring which fits in the lamp shell, inside of which the parabolic reflector is pivoted at a point 3 in. on each side of the bottom by a spring tension, a spring which holds the reflector in its normal or tilted position, an adjusting clip by which the movement of the reflector may be regulated, and a bellows constructed

# New Graham Truck Designed for Fast Hauling

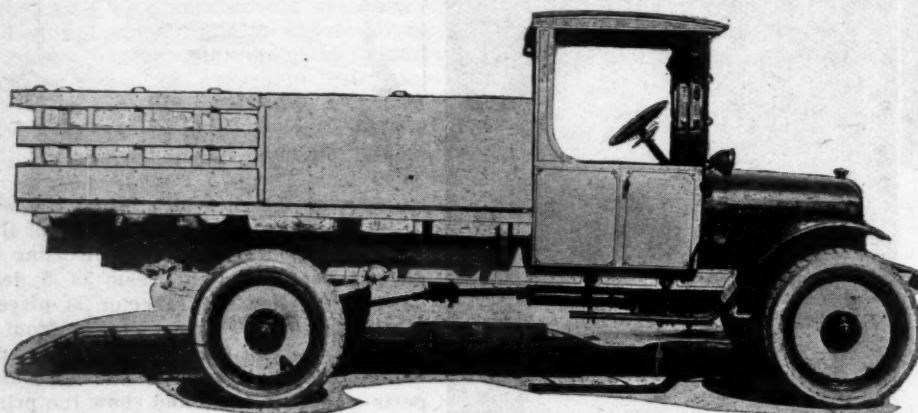
Is 1½-Ton Capacity and Will Carry Full Load 25 M. P. H. Has Continental Engine, Disteel Wheels and Pneumatic Tires

THE Graham Bros. speed truck has been designed to carry a full 1½-ton load at a speed of 20 to 25 m.p.h. with safety and efficiency. Accessibility is a factor which has received careful attention and such refinements as Disteel wheels and pneumatic tires of truck type are standard equipment.

The Continental engine has a three-bearing crankshaft, a constant level lubrication system maintained by a plunger pump and thermo-syphon cooling through a fin and tube type removable core radiator with pressed steel shell. An Eise-mann magneto furnishes the ignition and

## SPECIFICATIONS

CAPACITY, tons	1½
CHASSIS, price	\$2,295
WHEELBASE, in.	133
TIRES, front and rear,	
pneumatic	35 x 5
BORE, in.	3¾
STROKE, in.	5
N. A. C. C. HP	22.5
SPEED, M. P. H.	20-25
FINAL DRIVE	Int.-gear



Graham speed truck will carry 1½ tons at 20 to 25 m. p. h. with safety and efficiency. Disteel wheels and pneumatic tires are standard equipment

a combination gear-driven generator furnishes current for electric head and tail lamps.

A Stromberg carburetor is fitted and engine speed is controlled by a Monarch suction type governor. Clutch and gear-set are of Fuller make and are in unit with the engine. The drive is through a two-shaft, three universal joint propeller

shaft which is supported in the center by a heavy bracket containing a self-aligning double row ball bearing.

The Torbensen rear axle has nickel-steel gears and the entire load is borne by a drop-forged I-beam dead axle. Disteel disk wheels are fitted and the equipment includes electric head and tail lamps, electric horn, storage battery, en-

gine-driven tire pump, odometer, speed-governor, motometer, set of tools and jack.

Although the new truck is listed as a chassis it can be had with cab and choice of four bodies (express, stake-platform, double box or high rack and canopy types) for \$2,470.

## Ohio Trailer

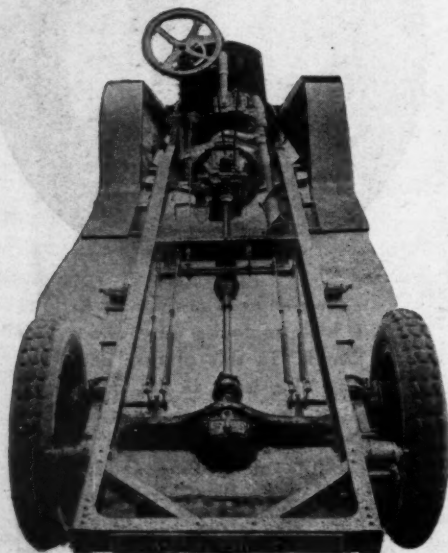
TWO new models of trailers have been put on the market by the Ohio Trailer Co., Cleveland, Ohio. The four wheel trailer is of the reversible and is sold complete with either cattle rack or panel body.

The frame is constructed of 3-in. steel braced to provide the strength required. The axles are automotive type with heavy duty ball bearings. The springs are quarter elliptic.

The method of mounting allows full spring action regardless of the direction of travel. The right amount of castor is provided to compel the trailer to track perfectly with the car that pulls it and to eliminate any weaving or swaying action. The tire equipment is optional, either 28x 2½ solid clincher truck type or 30x3½ pneumatic tires being supplied. The bodies are painted gray with black chassis.

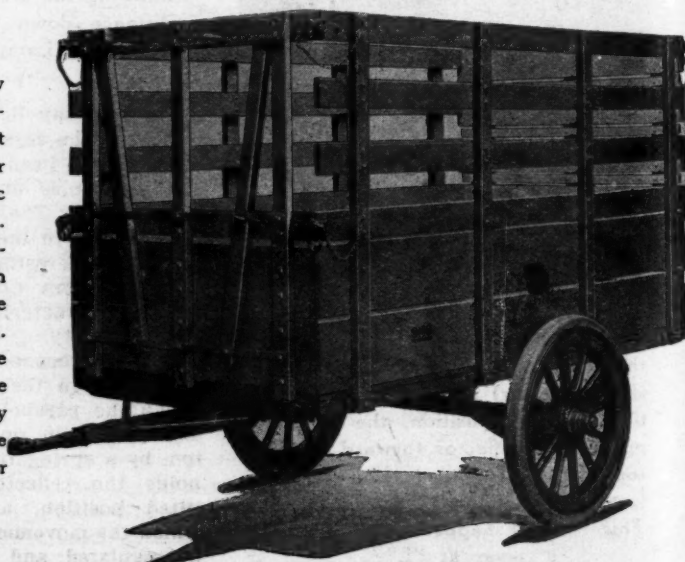
## HAYNES, NEW YORK CO. ENLARGING

New York, March 7—That the New York branch of the Haynes Company was contemplating enlarging their present salesrooms was foreseen in the purchase of property at 1717 Broadway. This adjoins the present property at 1715 Broadway. The building which they formerly held by lease has also been purchased; \$200,000 is the price given for properties.



View of the Graham chassis

One of the two new models of Ohio trailers. Tire equipment is optional, either solid or pneumatic tires being supplied. The bodies are painted gray and with black chassis. The frame is of 3 in. steel. The axles are of the automobile type with heavy duty ball bearings. The springs are quarter elliptic





# Standard Mechanical Operations in Tractor Service

by John Charles Thorpe, M.E.  
and Gustav Howard Radebaugh



**EDITOR'S NOTE:** The two pages herewith are the eighth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In last week's issue of *MOTOR AGE* we told of the operations necessary to correct the troubles caused by dirty contact points in the distributor. This installment deals with the engine firing intermittently, or will not start, caused by dirty or corroded firing points in breaker or interrupter and how to clean them. It is often the case that the more simple a trouble may be the more difficult it is to locate. It is with this in view that we present this series which deals with the everyday problems that may confront the tractor owner and tell here how to locate and remedy these troubles.

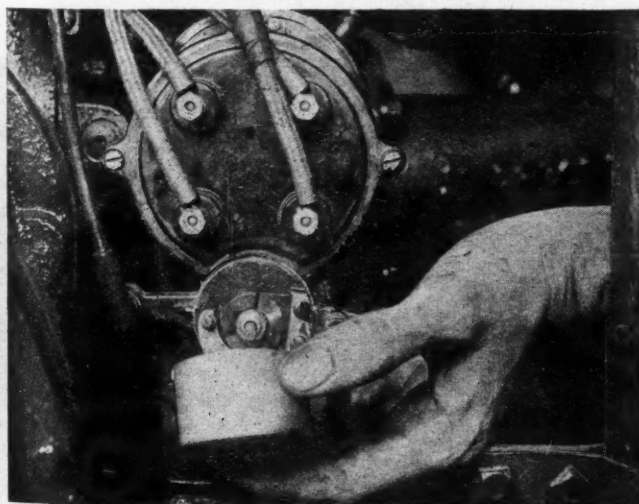
## Part VIII—Firing Points of Breaker or Interrupter

As was shown in the discussion of the generation of the secondary or high tension current, in the preliminary text, the high tension current is produced by the phenomena of electro-magnetic induction, and the flow of the current induced in the secondary winding or circuit depends upon the periodic interruption or breaking of the primary circuit. In the magneto described, the primary or low tension current is taken from the collector ring by the collector brush and then transmitted through a properly placed wire to a binding post on the high tension coil. Passing through the primary winding of the coil it is led to the adjustable firing point in the breaker or interrupter. As the armature shaft of the magneto rotates, the breaker cam brings both firing points of the breaker into contact, allowing the current to pass to the ground brush and thence to the magneto frame.

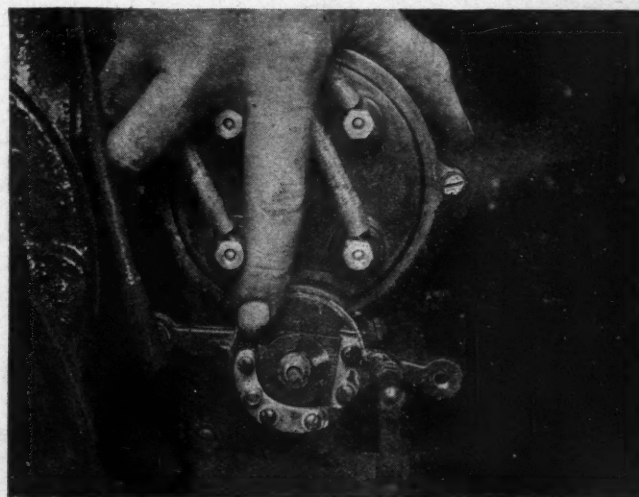
This completes the circuit since the primary winding on the armature is grounded on the magneto shaft. It has been shown that the current will not flow unless the circuit is closed.

It is clear that the contact points must be kept clean and that the space between them when open shall be properly adjusted.

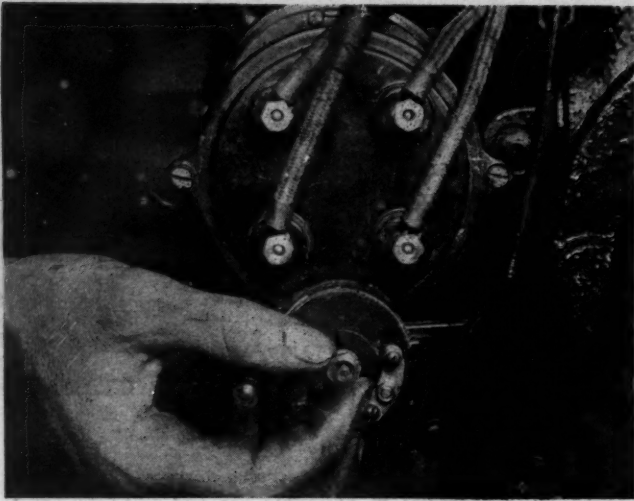
In the continuous use of the magneto, some wear occurs by the frequent contact of the faces of the firing points. Furthermore, particles of oil, grit and dirt will sift through the housing of the magneto and collect on these points. It is thus that a frequent cause of work interruption may be found in dirty, corroded or badly adjusted breaker points. It is indicated by the intermittent firing of the engine or extreme difficulty in starting.



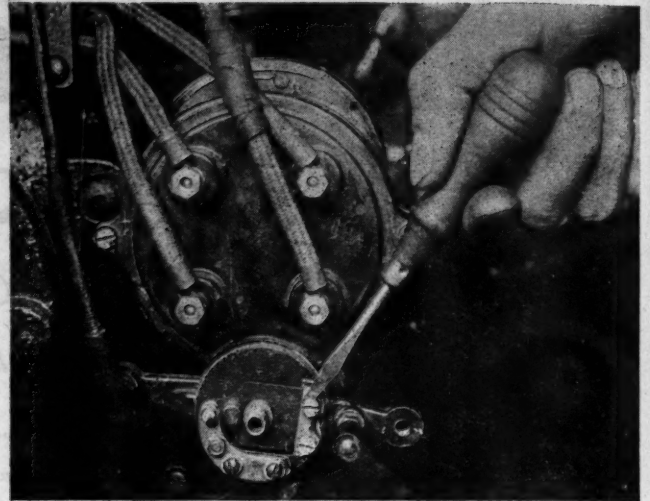
1. Remove breaker box cover. It will be seen that the ground connection brush makes contact with the magneto frame or base by a spring contact with the breaker box cover. The operator should note this construction carefully



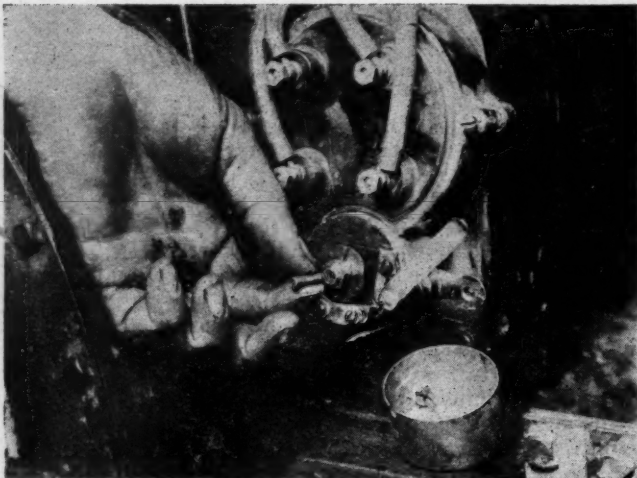
2. Observe firing points badly burned and pitted. It must be understood that the collection of dirt or "gum" on the surfaces through which the current must pass offers a resistance to the current flow. This generates a high degree of heat which burns and pits the surfaces of the firing points



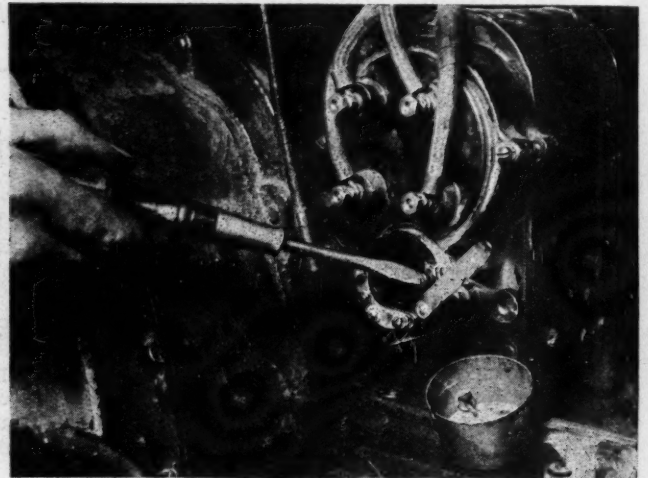
3. Remove retainer nut and ground connection brush. This needs to be done carefully in order not to injure the fine spring used back of the brush in this assembly



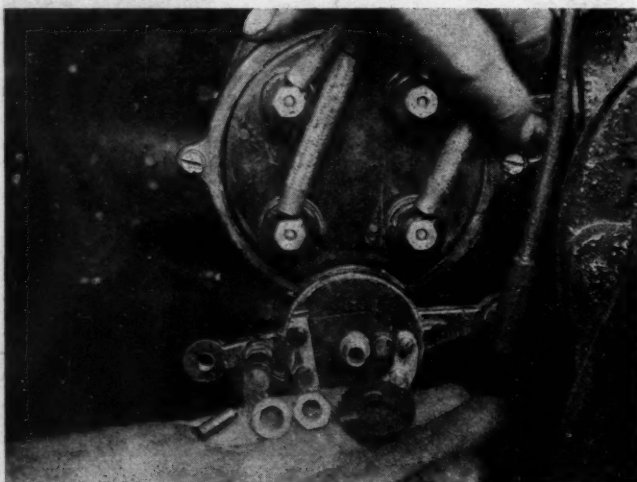
6. Carefully loosen and remove fastenings holding the carrier plate or blade. All of these parts are of delicate construction and must not be handled roughly if they are to be expected to operate satisfactorily



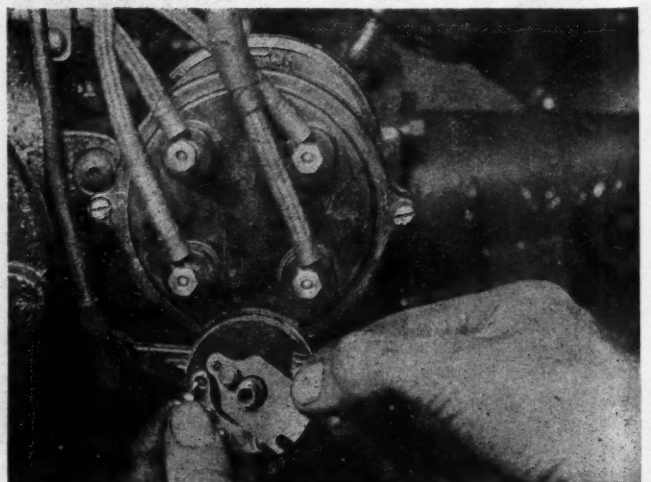
4. Removing ground brush and spring. The spring is depended upon to hold the ground brush in contact with the breaker box cover that is used as the connecting link to carry the primary current to the magneto frame, thus completing the ground connection



7. Removing screw from fastening. The breaker box cover makes a handy container for the small parts of this assembly and should be used as such to lessen the possibility of losing them.



5. Observe ground connection brush, spring, spacing washer, and breaker arm. An inspection of these parts will make the action of the cam in bringing the firing points into contact perfectly clear

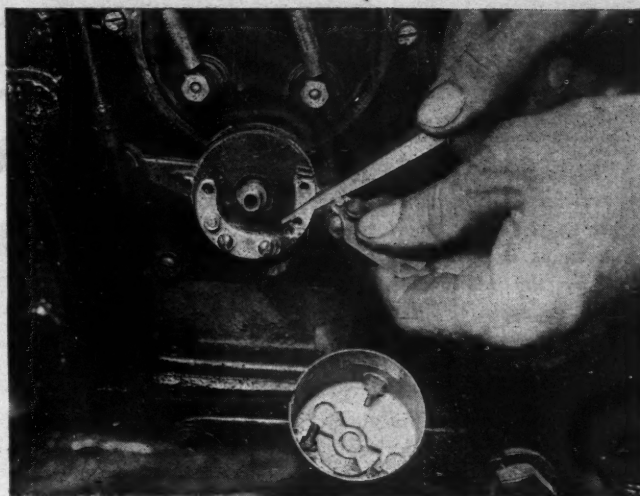


8. Remove carrier plate or blade. This procedure will show the relation of the fixed firing point to the adjustable one very clearly

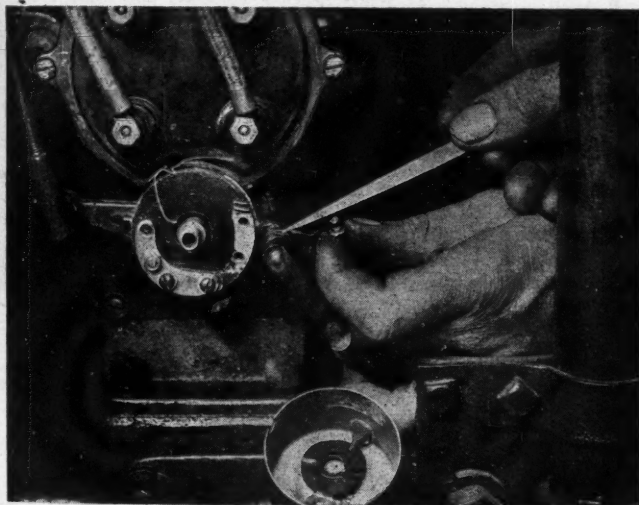




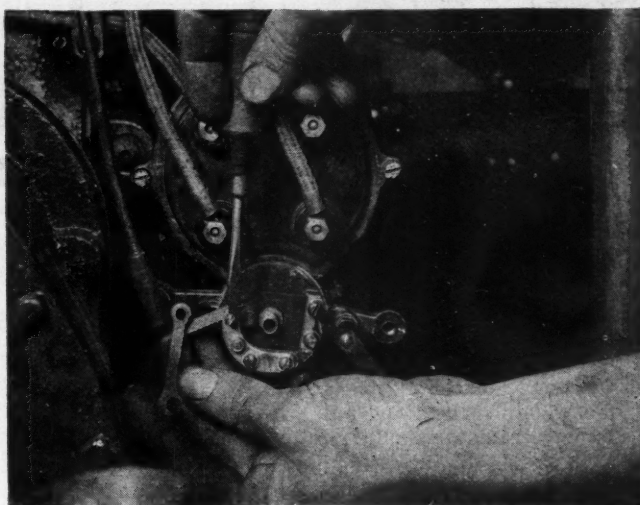
9. Inspect firing points after removal. The effect of the dirt or gum in producing the burned or pitted appearance of the points will appear more clearly in this procedure



11. Smooth up firing points on blade with fine file. Observe small parts removed are put in breaker box cover, as suggested in the previous procedure



10. Smooth up adjustable firing point with fine file. Only enough "dressing down" should be done to secure a smooth even surface. The material of which the firing points are made is very expensive and should not be filed away



12. Reassemble and test gage of firing points, by using .025 in. thickness gage. Adjust as necessary. The method and delicacy of adjustment will immediately appear upon disassembling the mechanism. Reassemble all parts with care, noting the particular relation of the bevel edge of spacing washer and indentation of breaker arm.

### Next Week—The Carbureter

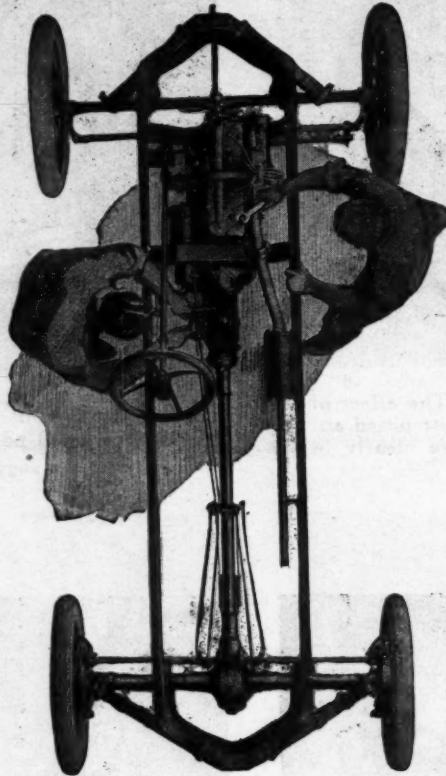
**Y**OU see in the pictures on these pages mechanical operations often referred to in discussions of locating engine troubles. You have been told to do this or that, but have not been shown how in a manner that would make it instantly clear.

By following this series you will have unfolded before you a motion picture method of performing service operations on tractors, trucks, motor car or any automotive products.

Next week we shall describe the troubles of carburetion. How to trace carbureter troubles and obtain the correct adjustment.

# SERVICING THE OVERLAND FOUR

**T**HIS is the sixth of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co., and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of *MOTOR AGE* on file are suggested to do so to get the benefit of this series.



## PART VI—The Engine

**T**HESE valuable articles—*Servicing the Overland Four*—will run serially each week until the service operations on the entire car have been explained. This week deals with the

## Engine

Next week will be a continuation of the service operations on the engine.

Keep a file of *MOTOR AGE* for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work more profitable, eliminate complaints and please your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

### TO REMOVE AND REPLACE POWER UNIT TO REPLACE ENGINE ASSEMBLY

Time: 3 hrs.  
3 hrs., 30 min.

1. Remove hood.
2. Drain radiator.
3. Remove front splashers by removing one  $\frac{1}{8}$ -in. cap screw, two  $\frac{3}{8}$ -in. cap screws and two  $\frac{1}{4}$ -in. stove bolts.
4. Disconnect battery cable at battery. Disconnect wires from lamp sockets and pull wires through shroud.
5. Remove radiator shell.
6. Remove  $\frac{1}{8}$ -in. nut on radiator stay-rod and pull rod out of radiator bracket.
7. Remove  $\frac{1}{8}$ -in. bolts, with nuts and lock washers from crank bracket.
8. Remove two  $\frac{3}{8}$ -in. radiator holding-down bolts with flat steel washers.
9. Remove one  $\frac{1}{8}$ -in. cap screw with lock washers from lamp stay-rod.
10. Loosen hose clamps on radiator hose.
11. Remove radiator.
12. Remove clamp bolts and remove clutch and brake pedal pads.
13. Unscrew accelerator button and disconnect spring.
14. Disconnect speedometer cable at speedometer head and universal joint.
15. Remove floor boards.
16. Disconnect brake rod from brake foot pedal by removing cotter and clevis pins.
17. Remove clamp bolt clamping clutch pedal to clutch operating shaft and remove clutch pedal and key.
18. Remove brake pedal.
19. Disconnect hand brake rod from hand brake lever by removing wing nut from rod.
20. Remove four  $\frac{5}{8}$ -in. nuts holding gearshift box to transmission.
21. Remove gearshift box.
22. Remove spark control wire from distributor.
23. Remove gasoline throttle control wire from carbureter.
24. Shut off gasoline supply at tank and remove carbureter choke wire from carbureter.
25. Remove gasoline tank to carbureter gasoline line.

26. Remove starting motor cable from starting motor.
27. Remove two clamp bolts from coupling connecting steering column to steering gear lower unit and drive up coupling.
28. Disconnect horn wire.
29. Pull steering gear column up out of the way.
30. Remove two cap screws holding muffler pipe to exhaust manifold.
31. Disconnect wires from ignition coil.
32. Loosen two clamp screws and remove ignition coil.
33. Disconnect primary ignition wire from distributor.
34. Remove nuts and lock washers from engine holding-down bolts.
35. Drive engine holding-down bolts out of frame hangers.
37. Put chain sling around engine.
38. With crane or chain falls, carefully remove engine from frame and place on suitable bench or in engine stand.
39. If engine only is to be replaced remove all cap screws holding transmission to engine base and remove transmission assembly. Install one starting motor cap screw to hold starting motor to frame. Place wood blocks between clutch thrust bearing and clutch plate, and remove cap screws holding clutch plate to flywheel.
- Remove clutch pressure plate. Drive out dowel pins. Remove all clutch plates. Take out clutch shaft front bearing.
- Install clutch shaft front bearing in flywheel of new engine. Put in asbestos driven disk—splined driven disk and pressure plate. Put on clutch plate assembly lining holes in plate with holes in flywheel. Fasten to flywheel with cap screws. Remove starting motor cap screws. Place transmission in position far enough to hook clutch shifting fork over clutch thrust bearing. Assemble clutch pedal on shaft and pry forward which will draw transmission assembly in position. Fasten transmission assembly to engine base with cap screws. Remove clutch pedal and key.
40. Put chain sling around engine and with crane or chain falls, lower into frame—one man at rear end of



engine to steer torsion tube into universal joint housing. It may be necessary to pry engine into position by using a piece of scantling or long board against front end of engine case and front axle.

41. Line up engine in engine frame hangers with short pinch-bar.
42. Insert right front engine holding-down bolt.
43. Insert right rear engine holding-down bolt. It may be necessary to use jack between frame sill and universal joint housing in order to insert right rear engine holding-down bolt. See Fig. 13.
44. Insert left rear engine holding-down bolt.
45. Insert left front engine holding-down bolt.
46. Two men put on side and front engine shields, engine holding-down lock washers and nuts. Fasten securely.
47. Place transmission sliding gears in neutral.
48. Place gearshift lever in neutral.
49. Put on gearshift housing assembly.
50. Put on four lock washers on gearshift housing studs.
51. Put on stud nuts and tighten.
52. Slip on brake pedal over clutch fork shaft.
53. Connect brake rod to brake pedal with clevis and cotterpins.
54. Put Woodruff key in clutch fork shaft.
55. Assemble clutch pedal and shaft and clamp securely with clamp bolt and nut.
56. Connect carburetor choke wire to carburetor.
57. Connect throttle control wire to carburetor.
58. Connect starting motor wire.
59. Put on gasoline tank to carburetor gasoline line.
60. Connect muffler tube to exhaust manifold with two cap screws, lock washers and nuts. Care must be taken to see that gasket is between exhaust manifold and muffler tube flanges.
61. Put on and clamp ignition coil in place.
62. Connect ignition wires to coil.
63. Connect primary ignition wire to distributor.
64. Connect spark control wire to distributor.
65. Check timing of engine. This is not necessary except when the timing gears, generator or distributor have been taken off.
66. Put on fan belt.
67. Put on radiator, fasten to frame with cap screws, lock washers and nuts.
68. Fasten radiator hose clamps.
69. Put on starting crankshaft and bracket assembly. Bolt to radiator with two  $\frac{1}{2}$ -in. bolts, lock washers and nuts.
70. String front lamp wires through holes in fan shroud radiator.
71. Put on radiator shell, lacing headlight wire through hole in radiator shell.
72. Slip front splasher under radiator shell and line up holes on shell and splasher. Fasten assembly to frame with one  $\frac{1}{2}$ -in. cap screw, two  $\frac{3}{8}$ -in. cap screws, and two  $\frac{1}{4}$ -in. stove bolts and nuts, using flat washers under cap screw heads.
73. Put on front lamp stay-bar.
74. Connect front lamp wires to lamp sockets, connect battery cable at battery.
75. Put on radiator stay-rod.
76. Fill radiator with water.
77. Put one gallon oil in engine base, through engine breather tube.
78. Connect up speedometer cable at universal joint.
79. Put in floor boards.
80. Put on pedal pads.
81. Connect accelerator spring and screw on accelerator button.
82. Connect speedometer cable at speedometer head.
83. Tune up engine.
84. Put on hood.

#### TO TAKE UP CONNECTING ROD BEARINGS

Time: 3 hrs.

1. Remove engine shields by removing engine anchor bolt, nuts and lock washer.
2. Drain oil base by removing plug at bottom of base.

3. Unscrew all cap screws holding engine oil base to transmission housing.
4. Remove all cap screws holding oil base to engine.
5. Remove oil base.
6. Pull cotterpins from connecting rod bearing cap bolt nuts.
7. Beginning with No. 1 cylinder, remove bolt nuts from bearing cap.
8. Remove bearing cap and take off from each bolt shims of equal thickness.
9. Replace cap and nuts and tighten.
10. Continue removing shims until a perceptible drag is felt on the crankshaft when the crankshaft is turned over.
11. Loosen bearing cap stud slightly.
12. Tighten the other three connecting rod bearings in the same manner.
13. After all bearings are adjusted, tighten connecting rod bolt nuts securely and cotterpin.
14. Put on oil base with sixteen  $\frac{1}{8}$  in. cap screws and seven  $\frac{3}{8}$  in. cap screws with lock washers under head, holding oil base to transmission case.
15. Put on engine shields with engine holding down lock washers and nuts.
16. Put in oil base drain plug.
17. Fill oil base with one gallon of good engine oil.

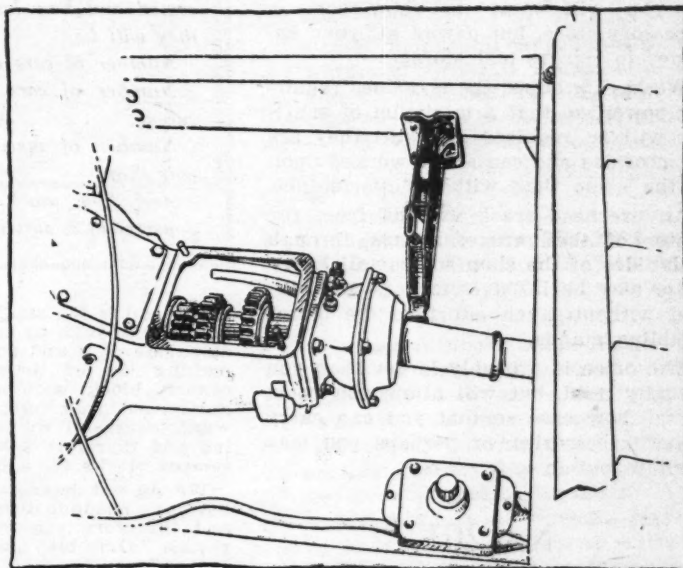


Fig. 13—Using jack to line up rear engine holding-down bolt

#### TO REMOVE AND REPLACE DISTRIBUTER

Time: 15 min.

1. Raise hood.
2. Remove primary and spark control wires from timer.
3. Loosen distributor clamp screws holding distributor to generator housing.
4. Remove distributor head.
5. Remove distributor.
6. Remove No. 1 spark plug.
7. Hand crank engine until No. 1 piston is at top of compression stroke travel.
8. Insert wire in spark plug hole and turn engine slowly until top of piston has reached its highest point of travel; continue cranking until top of piston is flush with cylinder block.
9. Turn new distributor arm member so that it is just coming in contact with No. 1 plug in distributor head with the breaker points just starting to break, with timer fully retarded.
10. Install new distributor, clamping in position with two clamp screws.
11. Connect primary and spark control wires to timer.
12. Lower hood.

# Garage Planning

## Service Station Arrangements

### No. 200

#### REPAIR AND STORAGE BUILDING

At present as I'm in the garage business here the first of the year I will start up a new shop. My shop here will be 50 by 150. I would be glad to get a good plan for a machine shop and garage and blacksmith shop all on 50 by 150. I wish to have in the shop two lathes, large drill press, power emery stand, burning and running-in machine, engine stand, a few bench tools, air compressor, reboring machine, light plant blacksmith shop with two fires.—J. W. Anselin, Nome, Tex.

Since you do not mention handling cars or accessories we take it for granted you will want no show-room or accessory store, but devote all your energies to repairs and storage.

We have grouped the machines requiring power, so that a minimum of shafting will be required and still they are not crowded and can all be worked upon at the same time without interference.

An overhead track extends from the center of the garage, swings through both sides of the shop so that all heavy parts may be lifted from cars and carried without much effort to the disassembling stands, etc.

The office is probably larger than you actually need, but will allow you room for a show case so that you can carry a few accessories, or perhaps you may want to put in a few tires.

### No. 201

#### STORAGE GARAGE WITH FILLING STATION

Enclosed you will find our check for \$3.00, which is explanatory in itself. I have taken your magazine for at least a year now and can say it has helped me wonderfully. I have been watching your garage planning all the time. In fact, that has been the first thing I looked at in each issue.

Our building at present is 50x140, one

*MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be used to include the following information:*

*Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.*

*What departments are to be operated and how large it is expected they will be.*

*Number of cars on the sales floor.*

*Number of cars it is expected to garage.*

*Number of men employed in repair shop.*

*And how much of an accessory department is anticipated.*

story, and is too small, but we happen to be lucky enough to have four vacant lots alongside of it and now want to consider making use of them. Our building is cement block with a trussed roof and galvanized iron but not flat roof. We want to use all we can of the old building and therefore ask what you think of cement blocks for a building of this size.

We do not handle any cars ourselves, but have headquarters for two car agents and therefore can make use of display rooms. Our big thing is storage and accessories; in fact, we are chock-full with storage cars. We were rather inclined toward a corner filling station, but we note you do not think much of the idea.

Our reason for it was due to the fact that we could let it out to some oil company and we would not be bothered with it, thereby cutting down our overhead expense. We have a shop but it has not made us any money, due to lack of system, I believe, but everything else has kept us busy.

This building situation is no small

item and if you can tell us how to overcome this high cost of material we will be greatly obliged.

Would you advise putting up a building 140x140, or if that is too large to conveniently park cars please give us your ideas accordingly.—Red Ball Garage, E. T. Haines, Blackwell, Okla.

It seems to be a toss-up whether to give your corner to the car agents, the oil company, or keep it yourselves for accessory sales, and really comes down to a determination of which will pay the most money.

It may be in this case—circumstances always alter cases—that you can get business from the oil station customers. We do not want to be misunderstood as being against corner oil stations except when they overshadow the real business of the concern. When a company specializing on sales puts an oil station in its most prominent display space we think it a mistake.

We would not advise cement blocks for the front of your building, they are too characterless, though they are perfectly good material and could be used to advantage for rear and side walls. The layout we show does not require very extensive alterations except in the front and you will have no trouble re-using the material you take out.

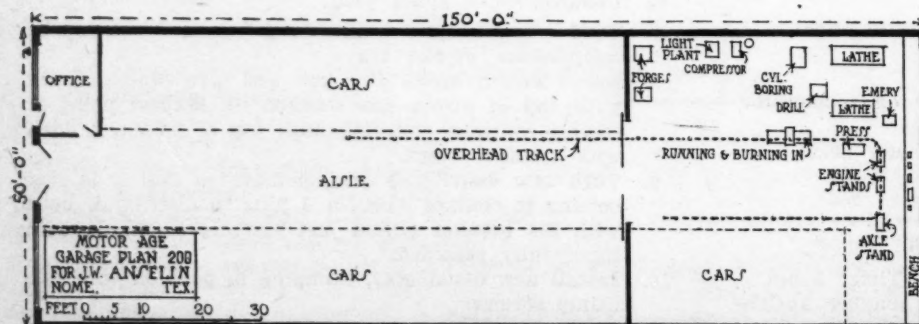
In the new section the roof could be supported by trusses, making the whole 90 ft. span, or by pairs supported midway on posts placed at points X. You might partition off a car show room for your car agents as indicated at B.

Why don't you form out your shop the same as the other departments, probably someone else could make it pay. This is being done to quite an extent; there seems to be difficulties that arise between storage customers and the shop that result in compromises at the expense of the company.

If the space allotted to the oil business does not seem adequate to the prospective tenant the space might be enlarged to the line A.

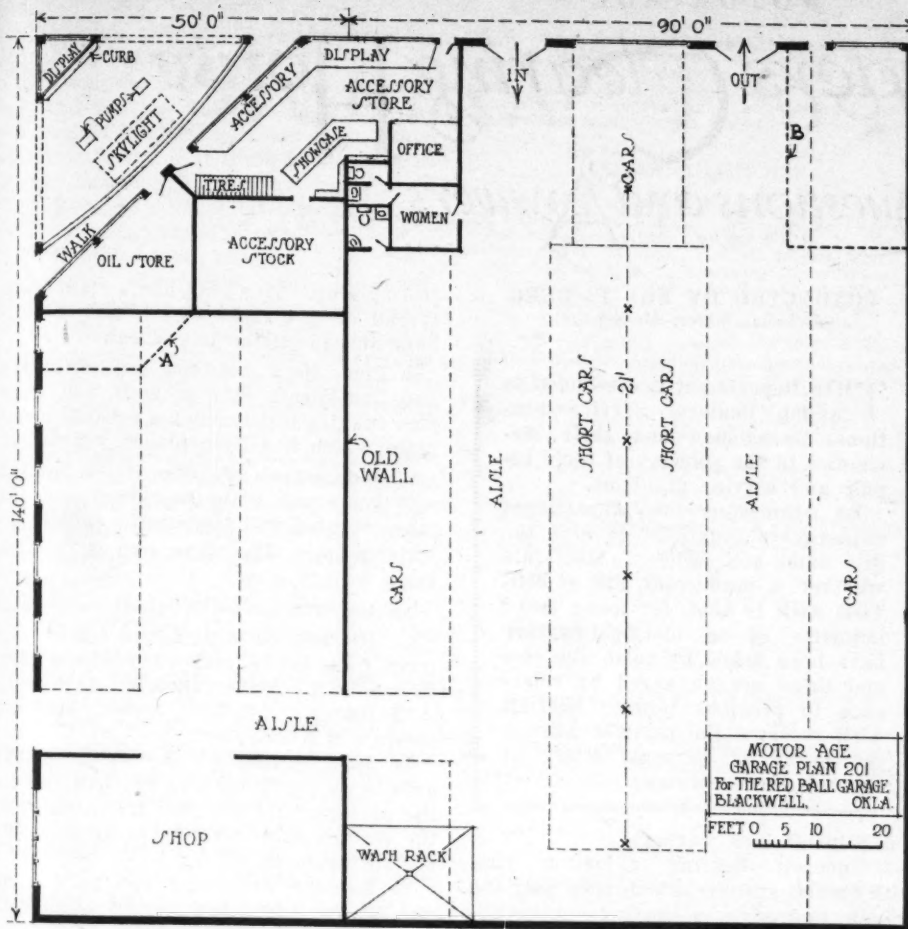
You have so many entrances that we would not plan to use an alley entrance on the ground that it would be superfluous. The 90-ft. extension is not quite wide enough for the best storage space, but you undoubtedly house many Fords, Maxwells and other short cars, and if you can group these in the two central rows you will have plenty of aisle space left.

You cannot handle long cars in these places except by replacing two short cars by one long one. It would be better to do this always in the front part as we have shown in order to give more aisle space adjacent to the entrances and offices.

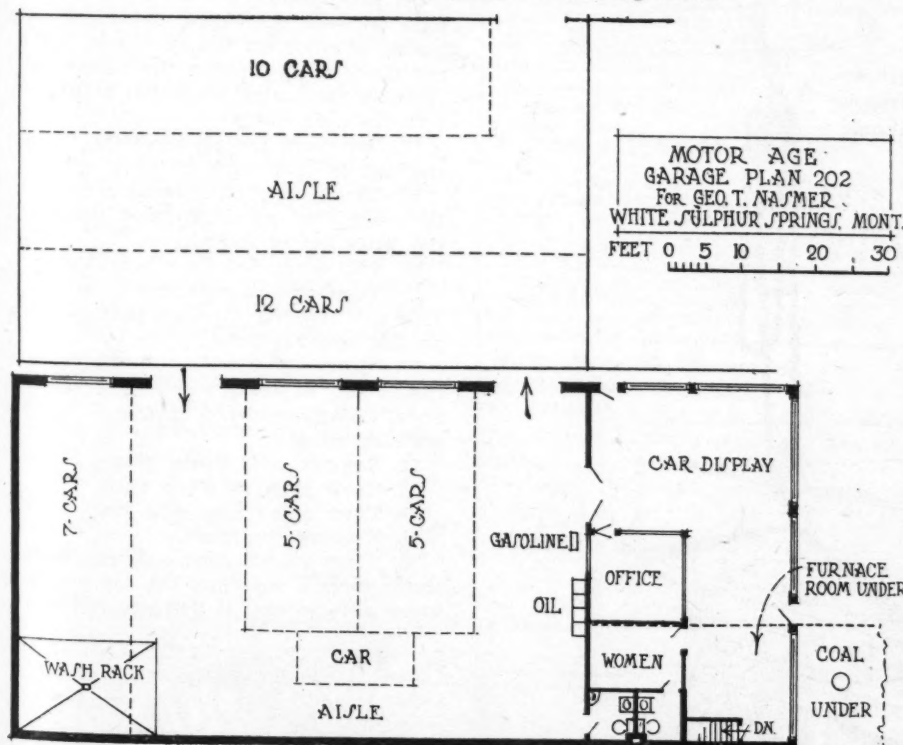


No. 200. Repair and storage building





No. 201. Storage garage with filling station



No. 202. Garage for sales and service only

## No. 202

## STORAGE AND DISPLAY BUILDING

I would like suggestions from you of a building on a lot 110x50, same to be used for storage and display only. Show 4 or 5 cars.

The building to be one story only with

basement for heating plant. Would also want rooms for the accommodations of patrons.—Geo. T. Nasmer, White Sulphur Springs, Mont.

It would be better to light the back part of the garage by two or three skylights than depend on windows on the vacant lot side as someone might

build there and your expense would be wasted.

This plan is a good illustration of the difference in capacity of the same garage made by different placing of cars. In one case, the lower, there are two entrances and accommodations for eighteen cars while in the other, the upper layout, there is only one entrance and twenty-two cars can be placed, all just as accessible as before.

The furnace under the end of the show room with coal bin under the sidewalk would make a good arrangement.

## New Anti-Glare Headlight

(Continued from page 33)

lation diagram. The partial vacuum created in the engine by the suction stroke of the pistons is used to exhaust the air from the metal bellows connected to the reflectors when it is desired to light the road for a long distance, and places the reflector in its normal position. To do this the handle on the dash is turned to the letter H on the dial.

When it is desired to tilt the lamp the handle is turned to the letter L on the dial which closes the connection of the bellows with the engine and allows air to enter the bellows through a port in the valve. Communication is maintained between the inside of the headlight and the engine by a 1/8-in. annealed copper tubing and between the end of the tubing and the bellows by rubber tubing in order that the removable reflector unit may be easily removed.

One of the illustrations shows the possibility of long vision when normal position of the reflectors is retained, and another, the proof that the driver is not subject to the glare of headlights on an approaching car when they are in the tilted position. The latter picture mentioned was taken with a camera placed 60 in. above the ground which is about the level of the driver's eyes and approximately 150 ft. from the lamps and looking directly into them.

It is interesting to note the detail of the car on which the headlights are mounted because if there was any glare present, the camera because of its sensitiveness to light would have produced a meaningless blurr.

It is claimed that these lamps by proper adjustment can be made to comply with any form of anti-glare laws and still give sufficiently safe lighting of the road before them.

## LANCASTER PLANS SHOW

Lancaster, Pa., March 18—The sixth annual automobile show, to be held from March 31 to April 3, inclusive, will exhibit in the Eastern Market House more than one hundred models. The show receipts will go to the local armory fund. Manager R. W. Shreiner announces that the floor space is so arranged that all the aisles will have a width of ten feet.

# The Readers' Clearing House

## Questions and Answers

**Q**—Describe how to tear down, for overhauling, an internal gear drive in a Republic or Patriot truck.—Herbert Ludwig, Rockford, W. Va.

The operation described below applies to all Republic trucks fitted with the Torbensen internal gear drive axles and other trucks fitted with the same axle. To tear down the axle for overhauling it will be necessary to remove the whole from the chassis as described in the following:

1. Hoist rear of truck with chain hoist or block and fall and set trestle under rear of frame. Height of trestle varies with the different models, but should be so that wheels clear the floor by about 1-2 in.
2. Remove four cap screws from hub-cap flanges.
3. Slip hub cap off.
4. Remove cotterpin from axle spindle.
5. Remove hexagon nut from axle spindle. This is a right-hand thread on the right side and a left-hand thread on the left side.

**CONDUCTED BY ROY E. BERG**  
(Technical Editor, Motor Age)

**T**HIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

6. Slip off lock washer.
7. Unscrew bearing adjusting ring with special spanner which goes over the spindle and engages the lug on the ad-

justing ring. This ring has a right-hand thread on the right wheel and a left-hand thread on the left wheel.

8. Place jack between top of spring and underneath side of body and raise jack till tire just touches a greased metal plate which has been placed beneath it.

9. Slide wheel off. The outer bearing will come out with the wheel and the inner bearing will stay on the spindle.

10. Remove the other wheel in the same way.

11. Remove propeller shaft.

12. Remove cotterpins and clevis pins from four brake pull rods where they connect with rocker arms on axle.

13. Remove jacks from between springs and body.

14. Jack up axle till the weight of the axle is on the jacks and not hanging on the springs. Do not jack up so far that the springs exert an upward pressure on the spring bolts.

15. Remove cotterpins and nuts from end of the front and spring bolts and the lower end shackle bolts.

16. Roll factory truck under center of axle between the jacks and block with pieces of wood on the two ends, but do not block it up high or the springs will catch in the frame when you attempt to roll the axle out.

17. Drive out the spring bolts, replace the nut on each as it is taken out.

18. Lower axle onto factory truck by lowering the two jacks and then take the jacks out of the way.

19. Pull truck out from beneath car.

20. Turn axle upside down on truck. This will require two men, perhaps three on the larger trucks.

21. Clean off outside of axle, brake bands and exposed mechanism at the ends, using gasoline, kerosene or hot soda solution.

22. Remove axle drain plug.

23. Take axle to wash rack.

24. Turn axle right side up.

25. Remove top plug.

26. After grease runs out, run boiling water from a hose into the top plug and block axle so that it will run out of the

Fig. 1—Raising the body of the truck so that trestle can be under chassis frame. When in this position the wheels should clear the floor about  $\frac{1}{2}$  in.

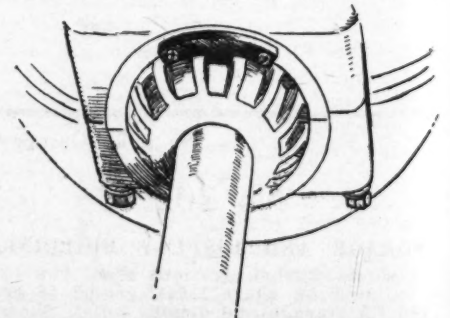
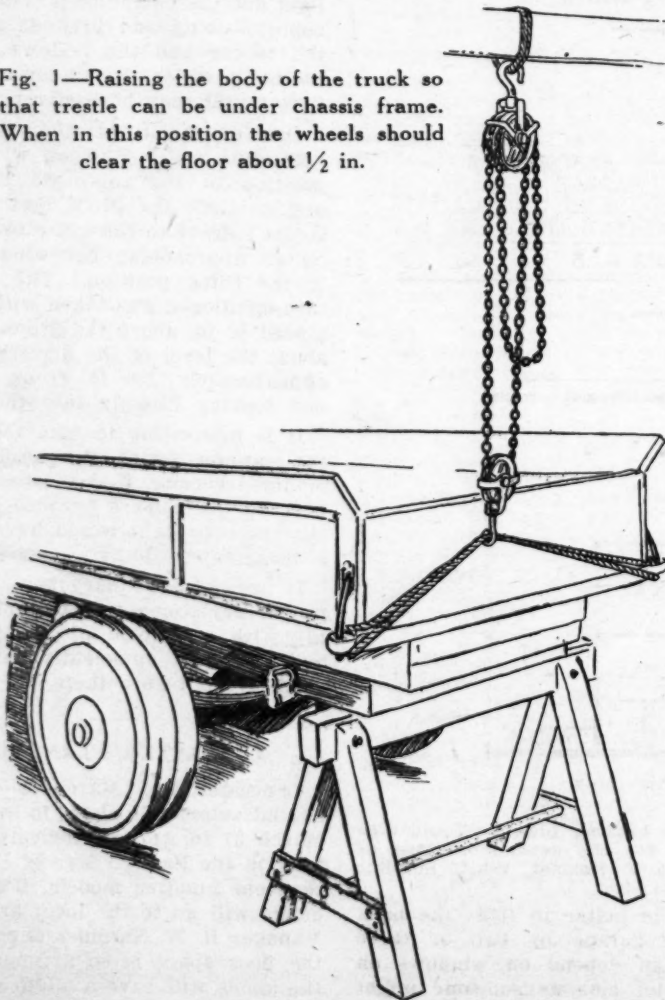


Fig. 2—The locking plate for the rear axle adjustment



bottom plug. About 15 min. will clean out all of the old grease.

27. Remove two screws from each differential bearing adjuster lock and set differential bearing adjuster with punch and hammer so that there is a minimum of lost motion without binding.

28. Replace differential bearing adjuster locks and replace screws.

29. Replace drain plug.

30. Pack differential with lubricant. This can be done by shooting very heavy oil or fiber grease through the top plug with a grease gun; or the differential cover can be removed by taking out the six holding screws, and the differential packed through the opening.

31. Replace top axle plug or differential cover, depending on method which was used to lubricate the differential.

32. Replace springs, clips and nuts, setting up tight as possible, and locking nuts on tight.

33. Put axle on factory truck, right side up and wheel into place under the truck.

34. Jack axle into position with two jacks.

35. Replace spring bolts, nuts and cotter pins, using grease.

36. Remove jacks and factory truck.

37. Replace propeller shaft.

38. Grease inner wheel bearings pinion gear and internal gear on wheel with heavy grease that will not run. Oil brake cams and joints.

39. Place jack between top of spring and bottom of body and raise jack till axle spindle is depressed so that the wheel will slip on the greased plate into place without lifting.

40. Grease outer wheel bearing and slip in place.

41. Replace bearing adjusting ring, setting it up tight with the special spanner, then loosen it from 1-8 to 1-4 turn till the wheel turns without binding, but without shake.

42. Replace locking ring, so that the lug on the adjusting ring fits into one of the holes in the locking ring. If it will not go, turn the adjusting ring to the nearest hole.

43. Replace hexagon nut and set up tight.

44. Put in new cotterpin and spread ends.

45. Replace hub cap.

TO assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

## Miscellaneous

Herbert Ludwig.....Rockford, W. Va.  
Ernest Borch.....Gary, Ind.  
Fred C. Tassell.....Sioux Falls, S. D.  
Henry J. Meller.....St. Louis, Mo.  
E. M. Rennie.....Dressler Jet, Wis.  
Herbert Ludwig.....Rockford, W. Va.  
Arthur Rhoads.....Coyle, Okla.  
M. C. McKenney, Reliance Motor Co.  
Howard S. Topping.....El Dorado, Ark.

Wainseot, L. I., N. Y.  
Geo. Laatsch.....Altamont, Ill.  
A. S. Hunter.....Durham, S. C.  
L. M. A. Roy.....Henniker, N. H.

## Cooling System

Clarence W. Golden.....Irontide, Ohio  
V. L. Daniels.....Racine, Wis.  
Edward Stowe.....Los Angeles, Calif.

## Carburetion

Lloyd Love.....Orion, Ill.  
V. L. Daniels.....Racine, Wis.

## Lubrication

V. L. Daniels.....Racine, Wis.  
I. C. Laundry.....Taconite, Minn.  
Franklin C. Marshall.....Cuba, Ill.  
Continental Service Co.  
Baltimore, Md.

## Engines

Andrew Scott.....Chicago  
Frank McKee.....Three Rivers, Mich.  
Franklin C. Marshall.....Cuba, Ill.  
N. M. Baldwin.....Norwich, Conn.  
Frank McCutchen.....Chicago  
I. C. Laundry.....Taconite, Minn.  
Clarence Honsaker.....Mason, Pa.  
Jesse P. White, Jr.....Lexington, Ala.  
H. S. Knight.....Benton Harbor, Mich.  
Howell S. Topping.....Wainseot, L. I., N. Y.  
Clifford Huckins.....Plato, Mont.

## The Electric System

S. A. Johnson.....Anus, Ia.  
Daniel DeKolt.....Hospers, Ia.  
Lloyd Love.....Orion, Ill.  
R. H. Prom.....Milton, N. D.  
J. E. Riffe.....Pittsburgh  
L. J. Hines.....Lake Charles, Ia.  
Pershing Garage.....Pershing, Okla.  
Wedlund Bros. Garage.....Bingham Lake, Minn.

46. Replace hub cap screws.

47. Put other wheel on.

48. Connect brake pull rods to brake arms, inserting clevis pins and new cotterpins.

49. Hoist body and remove trestle.

## PARTS

Q—A recently purchased speedster has no manufacturer's name. The bill of sale called it a Regal, but the frame is all that seems to be of Regal design. Transmission, rear axles, radiator and engine seem to be of different make. The engine and clutch are not in best condition and need some repairs. The engine is a Ferro engine but the engine number cannot be located so new parts could be ordered. What could be done to get these parts, or how could they be ordered? Is it true that the Ferro Motor Co. manufacture only Marine engines? Do they make or have they made automobile or tractor engines and what make of car used them?—Ernest Borch, Gary, Ind.

The Ferro Motor Co. built engines for the Briscoe and Jackson cars at one time. The car is evidently rebuilt with a miscellaneous collection of parts and, unless the numbers of the parts and the names of the manufacturers can be found, it is impossible to replace them.

## OBsolete Tire Sizes

Q—Is there a tire company that still continues to make 36x4 and 37x4½ tires of good quality not seconds.—Fred C. Tassell, Sioux Falls, S. D.

No, these sizes are obsolete.

## TIRE CHANGES

Q—In a recent issue of Motor Age you mention cutting size of wheel and speak of flexibility on the road. I have a 1912 Bergdoll rim size 34 by 3½ in., a size which is discontinued. This should be cut down to standard make so as to be able to get tires. What size do you recommend?

2—Will cutting down the size of the tire interfere with the gear ratio, or otherwise disturb the riding and driving qualities of the car, or will it only cut down the speed of the car and perhaps increase hill climbing power? The car makes about 30 m.p.h.—Henry J. Meller, St. Louis.

1—A popular size is 32 by 4 in., and this will not only be an economical one but will give plenty of clearance for the fenders. You might use 32 by 3½ and then you can use the oversize, which is 33 by 4.

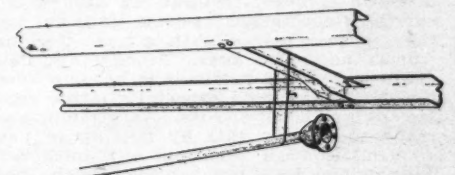


Fig. 4—Suspending the propeller shaft from the frame

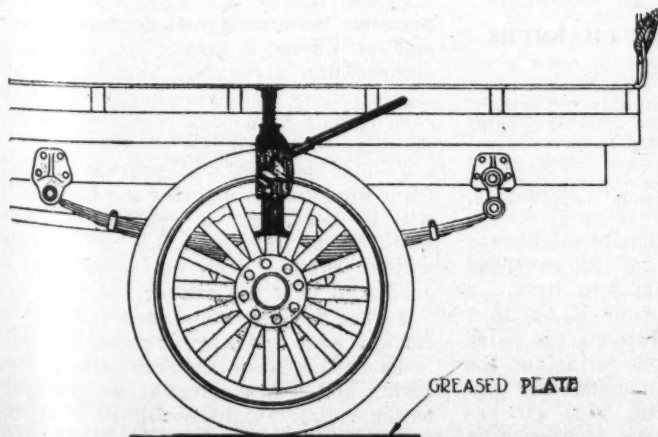


Fig. 3—Placing jack between axle and body. The jack should be raised, thus springing the wheels downward until the tire just touches the greased plate placed purposefully in position

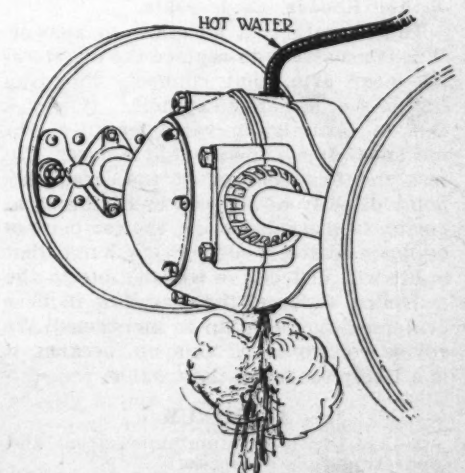


Fig. 5—Cleaning out the axle with hot water. The pipe plug is removed from the bottom to permit the water to drain out

2—There is so little difference in the sizes that it will make practically no difference in the speed, although to reduce the tire size will naturally reduce the car speed at the same engine speed. It will, however, be a little better in the case of climbing hills or in heavy going. The car is capable of better speed than 30 m.p.h., and if that is your present limit you will find economy in operation by tuning it up a little.

#### GEAR RATIOS AND SPEEDS OF OAKLAND AND BUICK

Q—What is the gear ratio of the 1918 Oakland six, high, intermediate and low?

2—What speeds could be expected from this car under ordinary conditions?

3—What is the maximum engine speed?

4—What is the engine speed of the 1918 Buick light six?

5—The Buick light six 1918 has gear ratio of 3.69 to 1. What speed could be made with this car under favorable conditions. (Smooth level road top down and no wind?) This car has been driven 62 m.p.h. with top up and three passengers. —E. M. Rennie, Dresser Jct., Wis.

1—The high gear ratio is 4.50 to 1, intermediate 7.87 to 1 and low 16.3 to 1.

2—Under ordinary conditions this car ought to attain a speed of about 55 m.p.h.

3—The engine develops its maximum power at 2600 r.p.m.

4—We have no information as to the speed of the Buick engine but it is about 2400 r.p.m.

5—We have heard of this model making a speed of as high as 65 m.p.h.

#### TIGHTENING DODGE CHAIN

Q—Explain how to tighten a starter chain on a 1918 Dodge.—Herbert Ludwig, Rockford, W. Va.

1—The illustration in Fig. 6 shows the adjusting nut on the Dodge engine that takes care of the slack in the starter chain.

#### STEERING GEAR TROUBLE ON A STUDEBAKER

Q—On a model 19 light Six Studebaker car the steering gear worms wore out and they were replaced with a new steering worm and worm gear. Since the new gears have been put in it is hard to keep the car in the road especially if the road is rough and full of ruts. An attempt was made to remedy this by putting in new steering knuckle pins and new bushings. This helped some but not very much. The wheels are in perfect alignment being  $\frac{1}{8}$  in. Before the new gears were put in the car guided very easily and without any effort on the part of the driver.—Arthur Rhoads, Coyle, Okla.

This is rather a question to answer. Was it necessary to replace the old steering gear arm, that connects the drag link to the tie rod and spindle? If so was this rod exactly the same length as the old one? If not the trouble is here. Unless the two centers of the drag link point directly at the center of the front spring front shackle bolt, the car can not be made to steer easy. Every bump that is hit will deflect the wheels, due to the swiveling action of the drag link, if these centers do not line up as mentioned. We advise you to check this up, because it is a likely source of the trouble.

#### ALUMINUM

Q—Are Lynite or aluminum pistons and connecting rods a success?

2—What are the mixtures for the differ-

ent aluminum alloys?—Louis Arbs, The Greenwood Garage and Machine Shop, Greenwood, Wis.

1—You will find a discussion in the March 11 issue of Motor Age on the use of aluminum which will answer your question.

2—It is impossible to obtain the formula of the successful aluminum alloys in use as that is the secret which enables the companies to conduct their business.

#### CHANGING TREAD OF BABY SAXON ROADSTER

Q—A model B, Baby Saxon roadster has a 60 in. tread. In changing this to a 56 in. tread will it be necessary to buy anything other than a front axle, rear axle housing and two rear axle shafts?

2—Will the present transmission housing and differential work with the 56 in. housing. The car has only two speed forward. It is being rebuilt into racer.—M. C. McKenney, Reliance Motor Co., El Dorado, Ark.

1—With a reduction of only four in. in the tread you can make the change with the use of a new front axle, rear axle housing and two rear axle shafts.

2—The present transmission housing and differential will work with a 56 in. housing.

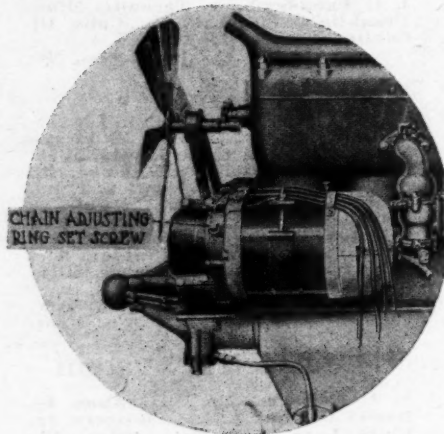


Fig. 6. Tightening a starter chain on a Dodge

#### LINCOLN HIGHWAY

Q—Are Spacke cars now being produced in any quantity?

2—Where can I get a road map of the Lincoln Highway from New York to San Francisco?—Howell S. Topping, Wainwright, L. I., N. Y.

1—Yes, the Spacke is being produced in quantities.

2—A map of the Lincoln Highway can be secured from the Lincoln Highway association, Garfield Bldg., Detroit.

#### SPEEDING UP A 1916 CHALMERS

Q—In 1916 the Chalmers Co. built a car selling for \$1095 called the "3400 r.p.m." Chalmers. What was the displacement of this car? Did it have an overhead camshaft? What size tires did it have?

2—With a 2 $\frac{3}{4}$  to 1 gear what speed would I get? Would this car have the stamina to make a good racer?—Geo. Laatsch, Altamont, Ill.

1—The piston displacement of this car was 230.1 cu. in. It had an overhead camshaft and it has 34 by 4 in. tires.

2—We cannot recommend a 2 $\frac{3}{4}$  to 1 gear ratio in this car because the axles and parts are not built to withstand the strain. We would recommend that you use a 3 $\frac{1}{4}$  to 1 gear ratio. This will enable you to attain a speed of around 90

m.p.h. or more provided all other conditions are taken care of.

#### THE STUTZ RACING CARS

Q—Has a Stutz car been entered in any of the major races since the 1915 Elgin race, when the Stutz, I believe, was a winner?

2—What mileage usually determines a broken-in condition of a new car?

3—Was the Stutz originally a foreign-built car, and if so, where built?

4—Would the installation of a tire inflation air pump, with small gear mounted on the pump shaft similar to that on the Haynes models, interfere in any way with the performance of the Stutz engine?—A. S. Hunter, Durham, S. C.

1—The Stutz racing cars as a team backed by the manufacturers have not competed since 1915. The cars were purchased by racing drivers and have been campaigned since that time.

2—A car is usually considered broken in after it has traveled about 1000 miles.

3—The Stutz car was designed by Harry Stutz and manufactured by the company he organized known as The Ideal Motor Car Co., Indianapolis, Ind. This company was absorbed by the Stutz Motor Car Co., the present manufacturers of the car.

4—The installation of a tire inflation air pump on this car will not interfere in any way with the speed of the car nor detract from its present power rating.

#### REBUILDING A STODDARD-DAYTON

Q—Would better results be secured from 3 $\frac{1}{2}$  to 1 gear ratio than with 3 $\frac{3}{4}$  to 1 gear ratio in very hilly country? Would you advise a lower gear?

2—An old Stoddard-Dayton valve-in-head engine is very hard to crank. Would plates  $\frac{1}{8}$  in. thick put under the cylinders lower the compression and cause the engine to run better?

3—Would winding a strip of thick felt between the rear crankshaft bearing and the flywheel and securing it with a coil spring prevent the oil from running out and getting onto the flywheel? Could you suggest a better way?

4—Which leaf should be removed in a semi-elliptic spring to make the car ride easier?—L. M. A. Roy, Henniker, N. H.

1—A change to this lower gear ratio will give you more power on the hills. The weight of the car will have to be taken into consideration to determine what advantages are to be gained by the change. We advise a change to a gear ratio of 4.5 to 1 if power is the thing desired.

2—It is not advisable to make any changes that will reduce compression pressure because it will decrease power and our advice is that if you have high compression pressure, hold it by all means unless the engine knocks in which case it will be necessary to reduce the pressure to stop it.

3—This method will prevent the oil from working through for a while but it will be necessary to replace this felt quite often. However, this is the only way it can be done unless you cut a groove to hold the washer.

4—The spring is designed to carry a certain load and any changes that are made will reduce the strength of the spring and it is a question whether any better riding qualities will be obtained or not.



## Cooling Systems

### AIR COOLING SYSTEMS

Q—Is the system of air cooling of the engine used on the Delco and Willys light engines covered by patents? The air cooling system used is similar to the one on the Franklin car. The flywheel sucks the air by the cylinder covered by thin metal jacket.—J. H. Taylor, Madison, Wis.

The various systems of air cooling are undoubtedly covered by patents. The American Blower Co. of Detroit owns and controls the patents covering the cooling system used by the Franklin Co.

### WATER PUMP AND THERMO-SYPHON COOLING SYSTEMS

Q—Is a water pump on an engine a greater advantage than a syphon in both summer and winter?—Clarence W. Golden, Irondale, Ohio.

There is a great difference of opinion about cooling systems used in the automotive field. Both systems have their advantages and disadvantages, but car specifications for the year 1920 show pump installations exceeding the thermo-syphon system. Out of 114 American pleasure cars only 34 are using the thermo-syphon system. Perhaps the reason for the predomination of pump circulation is not due to its superiority of design but rather the fact that the system is cheaper to build. A thermo-syphon system is really ideal and requires perfect design in order to operate properly. When both systems are properly designed they will operate very satisfactorily under all conditions and the question as to which system gives the greater advantage will have to be left to your judgment.

### COOLING SYSTEM ON A FORD

Q—How much more water than the stock radiator will hold is necessary for cooling a Ford?

2—What is the correct way of laying out both intake and exhaust cams for low and high speed engines?—V. L. Daniels, Racine, Wis.

## Carburetion

### INSTALLING PRIMER ON HUPMOBILE

Q—On a model N Hupmobile, car No. 63249 the intake is cast in the cylinder block. Can the block be tapped on the left side where the intake comes through and put on a primer? Where is the best place to install a primer?

2—The engine of the above mentioned car heats even though a new radiator has been put on. What is the best thing to put in the engine to remove the scale? Would it be best to stop us the hose connections and use chemicals in engine only. The removable jacket cover is no longer removable.—Lloyd Love, Orion, Ill.

1—The best place to install a primer is in the upper section of the intake. This can be done by tapping it where you suggest.

2—Heating may be caused by a great many things and unless you are sure that the scale is preventing the circulation of the water it is not advisable to use a chemical in the water. If scale is causing the trouble add a little sodium hydroxide to the water and allow it to remain in the system about twenty-four hours. Drain the system and clean thoroughly with hot water. The sodium hydroxide solution used must be very

1—The Ford Company is manufacturing about one million cars every year and we think that if more water was necessary for cooling the Ford car the engineers of that company would have changed their design a long time ago.

2—Instructions on designing cams used in gas engine construction will be found in the "Gasoline Automobile" by Peter H. Heldt, published by the U. P. C. Book Co., 239 W. 39th Street, New York.

### IMPROVING COOLING OF A FORD

Q—The cooling system of a Ford car is not very satisfactory. The engine overheats quickly when climbing steep long grades or traveling through heavy sand. What would be the best way to overcome this. Would some other radiator help or a pump?—Edward Stowe, Los Angeles, Calif.

The cooling system of a Ford is known as thermo-syphon system and acts on the principle that hot water seeks a higher level than cold water, consequently when the water reaches a certain heat circulation commences and the water flows from the lower radiator outlet pipe up to the water jackets into the upper radiator water tank and down through the tubes to the lower tank to repeat the process. The excessive heating of the engine may be caused by improper circulation of the water, carbonized cylinders spark retarder causing late ignition, defective ignition system, clogged muffler or improper carbureter adjustments. The cause will have to be determined by a process of elimination. The installation of a water pump would not aid any in getting better cooling.

### ZENITH CARBURETER ADJUSTMENT ON HUPMOBILE

Q—Publish a picture of the Zenith carbureter used on the model N Hupmobile

weak or it will corrode and attack the cells of the radiator. The scale may also be removed if it is not too heavy by removing the hose connections from the radiator and placing a garden hose in the bottom one. This will provide enough pressure and the right direction of flow to remove the scale.

### SPECIAL FORD CARBURETERS

Q—Will the special Zenith Ford carbureter give as much speed and power with a sixteen-valve head and aluminum pistons and high-tension magneto as a Miller or Master carbureter would?—V. L. Daniels, Racine, Wis.

There are many things which govern the speed and power that can be obtained from any car and carburetion is undoubtedly one of the most important items. Carbureters that have been built especially for Ford cars have given greater speed and the claims made by their respective manufacturers have been very similar. You will have to arrive at a decision by comparing these claims by records of tests that have been made or by actually testing them out yourself.

engine and show adjustments.—Lloyd Love, Orion, Ill.

To increase or decrease the richness of the mixture close the hand throttle and turn the knurled nut beside the float chamber, until the engine runs smoothly. Turning the nut to the right decreases the amount of air, and turning it to the left increases the amount of air.

## Lubrication

### OIL PRESSURE PUMPS FOR FORDS

Q—What company makes oil pressure pumps to drive from the cam? Also hand supply pumps for oil supply?—V. L. Daniels, Racine, Wis.

We believe that you refer to the oil pressure pump design published in a recent issue of MOTOR AGE. There is no company that we know of manufacturing a pump of this kind, but from the description and drawings given, it can be built by any good mechanic. Hand supply pumps can be obtained from almost any automobile accessory company.

### OILING SYSTEM OF 1918 OLDSMOBILE

Q—Explain how the pistons and wrist pins of an 8-cylinder 1918 Oldsmobile model 45 are oiled.—I. C. Laundry, Tonawanda, Minn.

The oiling system of the Oldsmobile model 4, is a combination pressure and splash system. The wrist pins and pistons are lubricated by the oil which is splashed or thrown up to them from little buckets on the caps of the connecting rods. The oil is picked up from troughs under each connecting rod which are kept supplied with oil from the return tube in top of the oil pan.

### SPEED AND GASOLINE MILEAGE OF 1919 ELGIN

Q—What is the speed of a 1919 Elgin 6-cylinder touring car?

2—What gasoline mileage do they usually give for this car?—Franklin C. Marshall, Cuba, Ill.

1—The speed of the 1919 Elgin touring car is about 60 miles per hour, but under ideal conditions and expert driving has made as high as 67 or 68 miles per hour.

2—The number of miles per gallon can be obtained from this car is dependent on a great many things but particularly carbureter adjustment. The car ought to give 18 to 20 miles per gallon under average conditions.

### OPERATION OF FRANKLIN OIL PUMPS

Q—The oil gage on a Franklin car will not show pressure at low speed. What is the cause of this?

2—Explain method of adjusting oil pump on a Franklin car.—Continental Service Co., Baltimore, Md.

1 and 2—The principal characteristic of the recirculating force feed system employed is the delivery of a predetermined amount of oil under pressure to each of the main bearings and connecting rod bearings.

The oil reservoir forms the bottom of the crankcase. It is an aluminum casting, the corrugated surface of which is exposed to the air, so that the oil is constantly being cooled.

A gear-driven pump is housed within the walls of the oil reservoir and is connected to eight copper delivery pipes.

The pump draws oil from the reservoir

through a fine straining screen, and by means of a distributor that is a part of the pump, forces the oil in predetermined quantities to each main bearing. The oil passes from the main bearings, through drilled holes in the crankshaft, to the connecting rod bearings, from which it is thrown off by centrifugal force in a fine spray into the cylinders and onto all moving parts. The starter chain and sprockets are oiled by a lead from the front main bearing. The timing gears are oiled by excess oil from the front main bearing. To prevent an excess amount of spray from reaching the cylinder walls, baffle plates are placed between the cylinders and the case. The oil, after lubricating all the surfaces, drains back to the reservoir and is then pumped over again through the same course.

The amount of oil in the reservoir is indicated by a pointer on the oil intake pipe. It is always possible to know that the oil is feeding by observing the oil gage on the cowl board.

There are two adjustments for the oil pump—each a by-pass valve. One is a needle valve, located in the center of the pump, which regulates the amount of oil pumped to the bearings. The other is automatic safety valve, screwed into the pump at the second pipe opening from the rear, and set so that the pressure in the system cannot exceed 50 lb. The oil gage will operate on one pound of pressure.

To test oil pump discharge run the engine at such speed that the battery indicator just shows "Charge." Disconnect No. 4 and No. 5 pump leads and collect the discharge from them in a receptacle graduated so that one-half pint can be measured. At this speed, the oil feed from the two leads together should amount to one-half pint at the end of

200 spurts from one of the leads. The test should not be started until the engine is well warmed up.

The needle valve stem has a right-hand thread. Screwing the valve stem in, increases the amount of oil pumped; screwing the valve stem out, decreases the amount pumped. An approximate adjustment is one-fourth of a turn open.

Loosen the lock nut and screw adjusting screws down to increase pressure in system.

If too much oil is evident through frequent fouling of the plugs and excessive carbonization, see that the by-pass valve is not stopped up. This valve can generally be freed of dirt by removing the needle valve entirely and racing the engine. As soon as oil begins to flow from the needle valve opening, the by-pass is clear.

If too little oil is evident through loss of power, or scoring of cylinders, see that the by-pass valve is not open too much and see that the automatic pressure release valve is not binding. If the car had had a large amount of usage, leakage may be occurring within the pump, due to wear between the gears and housing. Compensate for this wear by reducing the thickness of its phosphor-bronze housing with fine emery cloth. Lay cloth on a smooth flat surface and be careful not to tip the housing while rubbing with the cloth. Do not make the pump too tight to turn freely with a screwdriver.

#### CALCULATION OF CONNECTING ROD AND MAIN SHAFT BEARINGS

Q—Publish power curve of the 1917 Saxon.

2—What is the approximate weight of this engine?

3—Give formula for calculating connecting rod and main shaft bearings, taking into consideration rubbing speed, surface or projected area only.

4—Where can one purchase babbitt suitable for bearings, such as S. A. E. No. 24?

5—Illustrate the valve arrangement on the Cameron engine.—N. M. Baldwin, Norwich, Conn.

1—The engine used in the 1917 Saxon developed about 35 hp. at 2600 r.p.m. From this information you can very easily plot a power curve that will be accurate enough for all practical purposes.

2—This is a figure that we do not know, but the engine should weigh in the neighborhood of 450 to 500 lb.

3—There is no exact rule for determining the bearing dimensions as used in modern engines. The general tendency is to make the bearings as large as possible, and if through this tendency the shaft has become overlarge, which will result in excessive bearing speed and the production of large quantities of heat, then the shaft is made hollow and a pump fitted to circulate large quantities of oil through the bearings constantly, thus eliminating this heat.

Let us take a six cylinder engine using three bearing crankshaft as an example, because this type of engine is used most extensively in this country, as far as chassis models is concerned.

Following are the rules for the dimensions of crankshafts of this type:

$$d = \left( \frac{D}{12} \right)^{\frac{1}{2}}$$

$$l = 1.06 d$$

$$l_1 = 1.3 l$$

$$l_2 = 1.3 l$$

$$l_3 = 1.75 l$$

$$w = 1.25 d$$

$$ts = 0.55$$

$$t_s = 0.8 \left( \frac{d^3}{w} \right)^{\frac{1}{2}}$$

In these formulas:

d = diameter of crankpin.

l = length of crankpin bearing.

d, d, d, = diameters of main crank journals front to rear.

l, l, l, = length of crank journals front to rear.

D = piston displacement of one cylinder.

w = width of crankarms, largest dimension.

ts = thickness of crankarm, short arm.

t, = thickness of crank arm, long-arm.

These rules give for a 3½ by 5 in. bore and stroke of a piston displacement of 48.1 cu. in. per cylinder, the following dimensions: Crankpin diameter, 2 in.; crankpin length, 2½ in.; diameter of main journals, 2 in.; length of front and central journals, 2½ in.; length of rear journal, 3¾ in.; width of crank arms, 2½ in.; thickness of short arms, 1 in.; thickness of long arm, 1 7-16 in.

These dimensions provided sufficient metal for satisfactory operation, but in these days of high engine speeds, there is tendency toward increasing the bearing sizes. For example, on the Marmon the crankshaft diameter is 2¾ in. The Marmon engine, though, is larger in size than calculated for.

## The Power Plant

### POWER CURVE OF WEIDELY ENGINE

Q—Publish power curve of the Weidely 1917 12-cylinder engine.—Andrew Scott, Chicago.

Power curves for the 12-cylinder 1917 Weidely engine with a bore and stroke of 2½ by 5 in. is shown in Fig. 8.

### POWER CURVE OF 1920 RUTENBERG ENGINE

Q—Publish power curve of the 1920 Rutenber engine having 3½ in. bore and 5

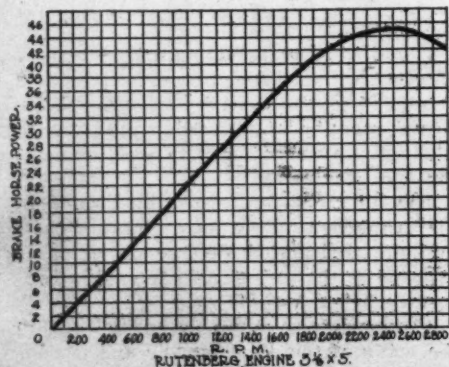


Fig. 7—Horsepower curve of Rutenber engine

in. stroke.—Frank McKee, Three Rivers, Mich.

This power curve is shown in Fig. 7.

### NOISY VALVES IN 1919 ELGIN

Q—How can the valve noise on a 1919 Elgin Six touring car be stopped?—Franklin C. Marshall, Cuba, Ill.

The valve noise in the Elgin Six engine is caused by the valve tappets. The fact that the overhead construction is not inclosed allows the dust and dirt to collect and will wear the guides and bushings. If the noise cannot be stopped by adjusting the valve tappets when the engine is hot you have to install new guides and bushings.

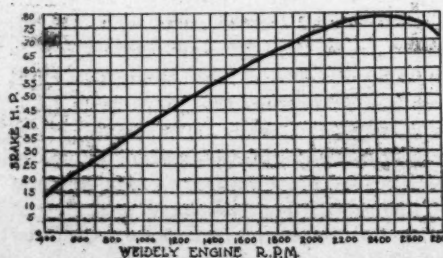


Fig. 8—Horsepower curve of the Weidely engine



4—Any large die casting house will be able to furnish you with bearing metal of any desired specification.

5—The Cameron engine has a valve arrangement as shown in Fig. 10 and Fig. 11.

#### VIBRATION IN 1919 SCRIPPS-BOOTH

Q—What causes the rear end of a 1918 Scripps-Booth roadster to vibrate at 15 m.p.h.? In this model there is a rod and spring that fastens to center of car instead of the springs going over axle and then to the end of chassis.—Frank McCutchen, National Stock Yards, Ill.

The vibration is probably caused by either a loose or tight adjustment of the differential gears and bearings rather than the spring action.

#### HORSE POWER OF OLDSMOBILE MODEL 45

Q—What is the horsepower rating of the engine of an 8-cylinder, 1918 Oldsmobile car, model 45?—I. C. Laundry, Taconite, Minn.

The N. A. C. C. rating of this engine is 26.5 hp.

#### POWER CURVE OF LYCOMING AND G. B. & S. ENGINE

Q—Publish power curve of the 3½ by 5 Lycoming four-cylinder engine.

2—Publish power curve of the 3½ by 4½ G. B. & S. four-cylinder engine.

3—About what speed should be obtained from a touring car equipped with either of these engines. Car weight, with engine installed and equipment estimated about 2800 lb., with 32 by 3½ wheels and 4.25 to 1 gear ratio?—Clarence Honsaker, Maestown, Pa.

1—The power curve is shown in Fig. 9.

2—Shown in Fig. 12.

3—Under average conditions a car with specifications as given should attain a speed of about 55 m.p.h.

#### BURNING-IN MACHINE

Q—Publish a plan for making a clutch to use in a burning-in machine employing a 24 by 4 in. pulley.

2—Would a 2½ hp. engine drive this machine, burning-in one bearing at a time?—Jesse P. White, Jr., Lexington, Ala.

1—It would be much cheaper to buy a clutch from a company such as Twin Disk Clutch Co., Racine, Wis., Brown Clutch Co., 1737 S. Camp St., Sandusky, Ohio, or the Hanava Mfg. Co., Havana, Ill., than to have one built according to some specified plan. Companies of this kind make a business of working out the plans for an individual through their engineering department.

2—2-1-2 hp. engine would not be sufficient, for it requires about 7 hp. for 1 bearing.

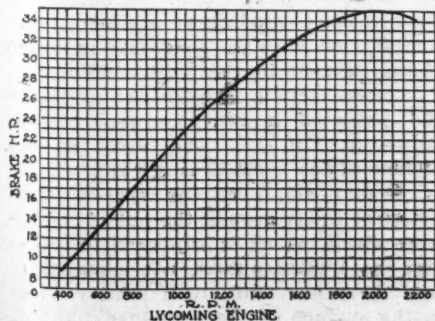


Fig. 9—Horsepower curve of the Lycoming engine

#### 1917 MAXWELL MISSES

Q—On a Maxwell touring car what test can be made to determine whether or not the condenser coil of the Atwater Kent ignition system is punctured. Engine runs very irregular at idling speed but does not appear to be missing and spark plug does not foul. When the speed exceeds 25 miles an hour it runs very well.—H. S. Knight, Benton Harbor, Mich.

Make and break the contact at the breaker points and if there is a very noticeable spark it indicates a loose connection or a punctured condenser. We believe that this irregular running is caused by poor carburetor adjustment. The intake valves may be worn so they spin and admit air. If this is the case it will be impossible to adjust the carburetor until they are replaced.

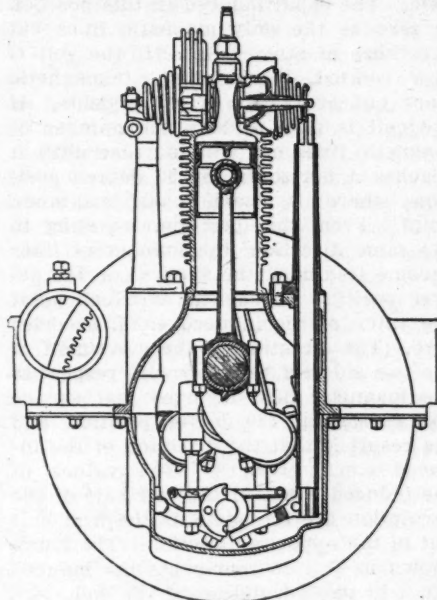


Fig. 10—Cross-sectional view of the Cameron air-cooled engine showing the surface cams which impart an oscillating motion to the valve rods

#### POWER CURVE OF THE DE LUXE ENGINE

Q—Publish power curve of engine used in Spacke car.

2—Is a 30 hp. engine connected with an air propeller as a driving means, as capa-

ble of delivering as many pounds push on a car that is stuck in the mud or going up a hill as if it were connected to the rear wheels as in all cars at present time?

3—Would it be as practicable to use a propeller to push a wind wagon as it is to push a sled?—Howell S. Topping, Wainscott, L. I., N. Y.

1—Power curve of the De Luxe engine used on the Spacke car is shown in Fig.

2—Because of the elasticity of the driving medium, air, the positiveness of an air driven machine is not so effective as if the driving was done to the hard and comparatively unyielding road through the rubber tires.

3—Yes, more so. The tractive effort necessary to pull a sled is quite often greater than that necessary to pull a vehicle. This is especially true if the wheels are provided with roller or ball bearings.

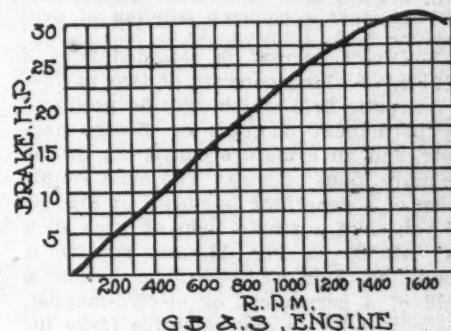


Fig. 12—Horsepower curve of the Golden Belnap and Swartz engine

#### MOTORCYCLE ENGINE FOR STATIONARY WORK

Q—I want to use a 1914 Excelsior engine, equipped with a Bosch ZEV magneto, for stationary work. Explain how to build a timer on the magneto driving gear so that two Ford coils and batteries can be used.

2—Give the firing order and piston position at time of ignition, also explain how to wire such a system.

3—If this plan is not feasible, state where an impulse starter might be purchased, or some other device that would give good service.—Clifford Huckins, Pinto, Mont.

1—In using a motorcycle engine for stationary work there is one thing in

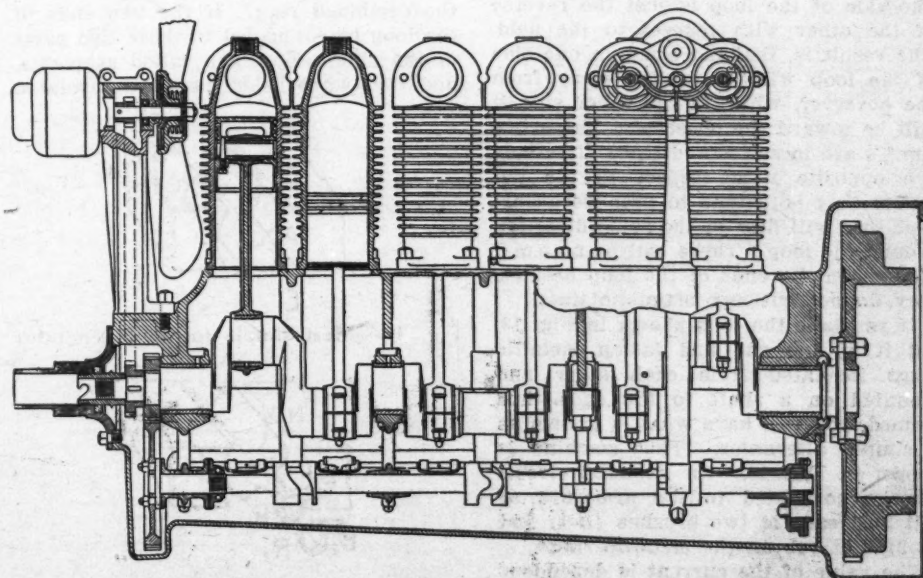


Fig. 11—Side view of the 6-cylinder air cooled Cameron engine

particular that must be provided and that is a suitable cooling device. The plan that you mention is not feasible for the installation you now have will prove satisfactory with the use of an impulse

starter. The Bosch Magneto Co. manufacturers of your present ignition system can furnish you with all necessary information on impulse starters.

2 and 3—See 1.

## Electric Systems

### THE GENERATION OF DIRECT CURRENT AND THIRD BRUSH REGULATION

Q—Explain why direct current is obtained from a generator.

2—Explain the third brush regulation on a generator.

3—What is gained by using the third brush regulation together with a differentially wound generator? Would not either one do the work alone, and which system is considered most efficient?

4—Where and at what price can I obtain a good book that will explain this. Do not want a book on winding of generator.—S. A. Johnson, Anus, Ia.

1—Direct current is obtained from a generator which consists of two parts—a magnetic field which may be produced by permanent magnets or electro-magnets, and an armature consisting of one or more loops of wire. The most simple form of a generator is shown in Fig. 13. If you take a single loop of wire such as (ABCD) in Fig. 13, and revolve it about an axis (EF) in the magnetic field of a permanent or electro-magnet, there will be an electromotive force induced in the two sides of the loop (AB) and (CD). This induced electromotive force will produce a current in the loop if the conductor forming the loop is closed. The direction of the induced e.m.f. in the two sides of the loop can be determined by Fleming's "Right-Hand-Rule."

Place the thumb, first and second fingers at right angles to each other. Now turn the hand into such a position that the thumb points in the direction of the motion of the conductor and the first finger points in the direction of the motion of the conductor, then the second finger will point in the direction of the current that is set up in the conductor by the induced pressure.

In our simple dynamo the motion of one side of the loop is just the reverse of the other with respect to the field. The result is, that the e.m.f. in one side of the loop will be flowing away from the observer, while in the other side it will be toward the observer. These two e.m.f.'s are in series and since directions are opposite with respect to the observer they both tend to produce a current that will flow in the same direction around the loop. There will be no e.m.f. induced in the ends of the loop because they do not cut any magnetic lines.

If you take the loop shown in Fig. 13, cut it at one end and fasten metallic rings insulated from each other and mounted on a shaft to the ends thus formed, you will have what is known as a simple alternator. This machine is shown in Fig. 15. An external circuit can be connected to the armature or coil by means of two brushes (B-1) and (B-2) that rub on the metallic rings.

The value of the current is dependent upon the e.m.f. induced, and this is in

turn dependent upon the number of magnetic lines of force cut by the coil. In our alternator, when the loop is in a horizontal position it will be cutting the greatest number of lines of force as it is exactly perpendicular to the direction of the field. Now start with the loop in a vertical position which places it in a plane perpendicular to the magnetic field. The e.m.f. induced in this position is zero as the only magnetic lines cut are those of stray fields. If the coil is now rotated, the number of magnetic lines cut will increase until it reaches a horizontal or 90 degree position where it reaches its maximum point. From this position, traveling in the same direction, the number of lines become less until the vertical or 180 degree position is reached, at which point the value of the induced e.m.f. becomes zero. The direction of the movement of the two sides of the loop with respect to the magnetic field changes just as the coil passes the 180 degree position, and the result is that the direction of the induced e.m.f. changes. The values of the induced e.m.f. in the last half of the revolution are the same as the first half but in the opposite direction. The curve shown in Fig. 16 represents the induced e.m.f. in one revolution of the coil.

The e.m.f. induced in the loop of wire just described can be made to produce a direct current or one that will flow in one direction in the external circuit. Suppose now, that we take the two metallic rings and replace them with a single ring composed of two parts that are insulated from each other, the distance between the ends of the two parts composing the rings being small in comparison to the total circumference of the combined ring. If the two ends of the loop be connected to these two parts of the ring, which are called segments, and the two brushes that are insulated

from each other be so mounted that they rest upon the insulation between the segments when the e.m.f. induced in the coil is zero, the connection of the external circuit with respect to the loop will be reversed at the same instant the direction of the induced e.m.f. in the loop changes. A simple direct current generator showing proper arrangement of the loop segments and brushes is illustrated in Fig. 17. The two part ring represents a simple commutator and the coil represents a simple armature. A curve which gives the value of the e.m.f. impressed upon the external circuit when a two part commutator is used is shown in Fig. 18.

An e.m.f. such as this, is called a pulsating e.m.f. because it pulsates or changes from zero to a maximum and back to zero at regular intervals.

If we place two closed coils at right angles to each other then the induced e.m.f. in one coil will be a maximum when the e.m.f. in the other is zero, and if this armature is rotated will give values of induced e.m.f. as shown in Fig. 19. With this arrangement and using a four-segment commutator with the terminals of each coil connected to opposite commutator segments, the e.m.f. between brushes will never fall to zero, but will be of form shown by the full line in Fig. 20 when the brushes are properly spaced. The e.m.f. can be made more nearly constant or direct by the use of more coils on the armature so placed with respect to the first ones that the e.m.f. induced in them never reaches a maximum or zero value at the same time it does in the others. A connection must also be made so that the induced e.m.f.'s act in series and in the same direction as far as the external circuit is concerned.

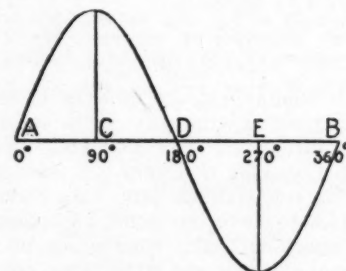


Fig. 16—The value of the induced e.m.f. in one revolution of the alternator

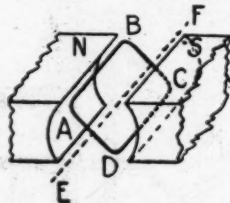


Fig. 13—Most simple form of generator

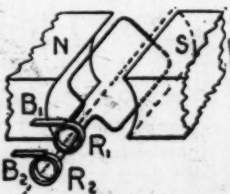


Fig. 15—A simple alternator

2—In order to understand the operation of the third-brush machine it will be necessary to make a brief study of the magnetizing action of the current in the armature winding of a generator in combination with the magnetizing action of the current in the field windings.

A cross-section through the armature and poles of a two-pole generator is shown in Fig. 21. The wires on the surface of the armatures are represented by twenty small circles spaced equal distances apart around the outside of the large circle which is supposed to represent the armature core. As a matter of fact, there are more than twenty wires on the surface of the armature, but this number has been used to simplify the diagram, the result being exactly the



same. The polarity of the poles is indicated by N and S; the polarity of the armature core by N and S; and the direction of the magnetic field by the small arrows.

If the armature be revolved in the clock-wise direction, as indicated by the large curved arrow at the top of the figure, as electrical pressure whose direction is away from the observer will be induced in the wires on the left-hand side of a vertical line through the armature, and an electrical pressure whose direction is toward the observer will be induced in the wires on the right-hand side of the armature. An electrical pressure, or current, toward the surface of the paper is represented by a plus (+) sign and one away from the observer by a minus (—) sign. If you will think of the + and — signs as being respectively the feathered end and flattened point of an arrow pointing along the wire, the diagram becomes plain. The direction of the current always can be found by the Right-Hand Rule mentioned previously.

The wires on the surface of the armature are all interconnected by the commutator segments, and a current will be produced in them when the brushes resting on the commutator are connected to a closed electrical circuit. This current in the armature will produce a magnetizing action just the same as the current in the field windings. The magnetic effect of the current in the armature windings of the generator may be investigated by sending a current through the armature from an outside source, such as a battery, in the same direction as the current the generator itself would produce, with the armature standing still and no current in the field windings. The general form of the magnetic field produced by the armature current would correspond to the dotted lines shown in Fig. 22, and its direction through the armature would be from the lower toward the upper side. The polarity of the armature is indicated by N and S in the figure. As a matter of fact, this magnetic field can never exist alone, but the magnetizing effect of the armature current combines with the magnetizing effect of the field current to form a resultant field whose general form will correspond to the one shown in Fig. 23.

The magnetizing effects of the armature and field currents may be considered just the same as two mechanical forces which are acting on an object at right angles to each other. Thus the

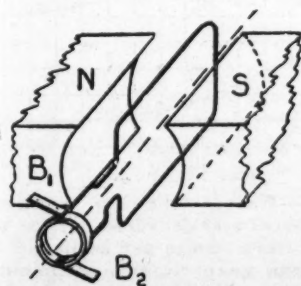


Fig. 17—Simple direct current dynamo

direction of the magnetizing force of the field current may be represented by the line marked G in Fig. 25, and its direction corresponds to the direction in which the arrow head points. Likewise, the magnetic effect of the armature current may be represented by the line A, and its direction corresponds to the direction in which the arrow head points. The two forces combine to form the resultant force R, which produces the magnetic field whose direction corresponds to the arrow head. The angle the resultant R makes with the horizontal will depend upon the relation between the two forces, A and F, the larger the value of A the greater the angle. This magnetizing action of the armature current is called armature reaction.

If the brushes be placed on the commutator in such a position that they rest on segments that are connected to conductors on the surface of the armature in which there is no induced electrical pressure, a maximum voltage for a given field strength and speed will exist between them. The brushes A and B in Fig. 24 are shown in a position for maximum voltage. If a third brush C be placed on the commutator midway between the brushes A and B, the voltage between A and C will be exactly the same as the voltage between C and B, because the same amount of magnetic flux is cut by the conductors in moving from C to A as is cut in moving from B to C. When the magnetic field is distorted, due to armature reaction, as shown in Fig. 23, the voltage between B and C will be less than the voltage between C and A, since there is a greater amount of magnetic flux cut by the conductors in moving from C to A than is cut by them in moving from B to C.

The position of the brushes shown in Fig. 21, 22 and 23 does not correspond to their actual position in practice, on account of having the end connections of the armature winding all of practically the same length. The winding can be imagined as being removed from

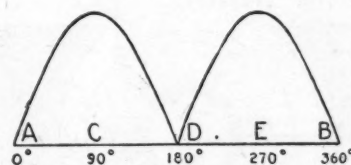


Fig. 18—Pulsating e.m.f. of direct current dynamo when two part commutator is used

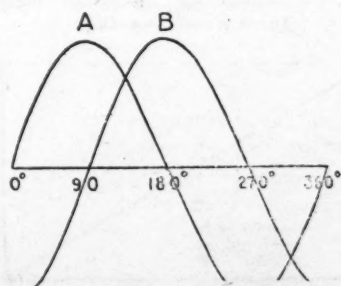


Fig. 19—Relationship of e.m.f.'s when two coils are used

the surface of the armature and laid out flat with the pole pieces shown shaded. The commutator segments are spread out and shown in their proper relation to the armature conductors. The various coils composing the armature windings are connected together at the commutator segments, and in order that the ends of these coils leading out to the commutator segments be of the same length and form, it is necessary that the segments to which the terminals of a coil are connected be as near the center of the coil as possible. For example starting with segments number two and tracing through a coil, you end up at segment number three, etc., and segments two and three are placed opposite the centers of the coils.

In order to simplify the diagram each coil is represented as being composed of a single turn. With this type of connection the main brushes will be in position opposite the centers of the poles, as shown in Fig. 22 and 23. The voltage between the brushes B and C will become a smaller and smaller part of the total voltage between the brushes A and B as the magnetic field of the generator is distorted, due to the magnetizing action of the armature current. The shunt field winding is connected to the brushes B and C, and the current in this winding decreases with an increase in speed of the generator. The current delivered by the generator increases in value with an increase in speed up to a certain maximum value and then starts to decrease with further increase in speed, due to the weakening of the magnetic field, as shown by the curve in Fig. 26.

3—The use of third brush regulation together with a differentially wound generator is a combination which represents the most perfect and efficient system of regulation and will aid greatly in the length of the life of the brushes. When operating alone there is very little difference in the efficiency of the

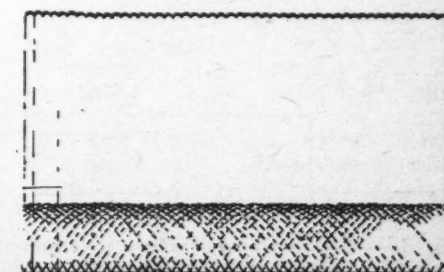
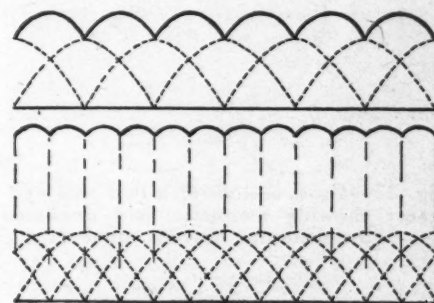


Fig. 20—The current generated when a large number of armature coils are used

two systems but the third brush has the suit existing conditions.

4—Electrical Equipment of the Motor Car, by C. P. Moreton and D. S. Hatch can be purchased from the publishers—U. P. C. Book Co., 243-249 West 39th Street, New York, for about \$2.50.

### AERO MAGNETO

Q—Publish the address of the company that make the Aero magneto used on the Indian Scout motorcycle, model G-20.—Daniel De Kok, Hospers, Iowa.

This magneto is made by the Splitdorf Electrical Co., Newark, N. J.

### STARTING CIRCUIT OF NORTH EAST SYSTEM ON A DODGE, ACTION OF THERMOSTAT ON REMY SYSTEM

Q—What causes the active material on the negative plate of some storage batteries to form blisters and eventually fall off?

2—Give starting circuits of the North East system as used on the Dodge car with four connections on the generator.

3—What is the object of the thermostat on the Remy system and what is its action?

4—What would the jumping of the ammeter needle from charge to discharge

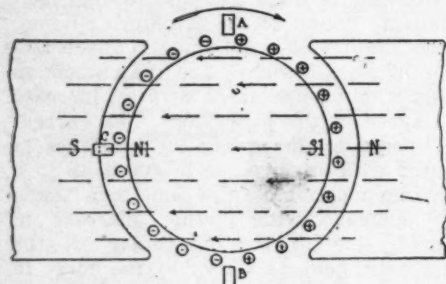


Fig. 21—Cross section of a two pole generator showing magnetic field produced by the field current alone

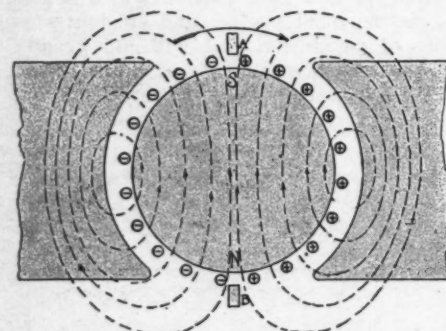


Fig. 22—Cross-section of a two pole generator showing magnetic field produced by armature current alone

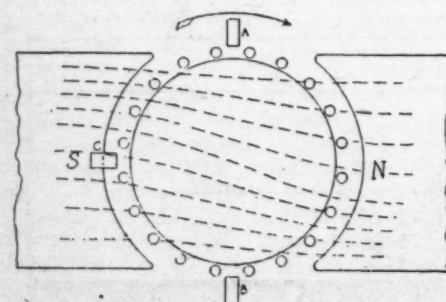


Fig. 23—Cross-section of a two pole generator showing resultant magnetic field produced by armature and field currents acting at the same time

with the cutout points closed indicate?—R. H. Prom, Milton, N. D.

1—The blistering action as you describe it is caused by the charging of the battery. It has been determined beyond question that the injury done a battery is due to the charging and not the discharging. It might be that the charging current in your case is too high. Excessive charging is causing more battery trouble these days than from any other likely source.

2—The starting circuits are shown in Fig. 29.

3—The thermostat used on the Remy system is shown in Fig. 27 (A). In (B) of the same diagram the dotted line shows the path of flow of the current. Notice that the points of the thermostat are separated in (C) as a result of heat and the path of flow of the current has changed. This shows the advantage of the thermostat in that it causes a large volume of current to flow through the battery and brings the battery to a gassing point quickly, at which time the battery begins to absorb a charge thereby providing an early return of current expended in starting. The thermostat resistance also acts as a protective device to the generator in case the battery or generator circuit should ever become disconnected in operation from either accident or neglect, the resistance wire would then burn out and prevent the generator windings from being damaged.

4—We believe this is a result of poor contact in the cut out although it may be an indication of a broken or loose shunt field connection. It would be advisable to clean the contact points of the cut-out with fine sandpaper and if no results are obtained look over the field connections thoroughly.

### INSTALLATION OF A BOSCH MAGNETO

Q—Publish wiring diagram of a 1913 Overland car.

2—Instruct how to install a Bosch magneto.—J. E. Riffle, Pittsburgh.

1—The wiring of the 1913 Overland cars was shown in the February 19 issue of MOTOR AGE.

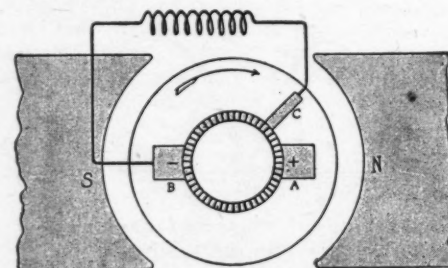


Fig. 24—Connection of shunt field on third brush machine

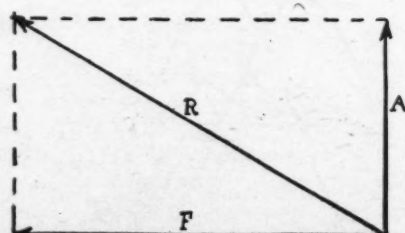


Fig. 25—Combined magnetizing activities of armature and field currents

2—When installing a magneto it is chiefly necessary to have it perfectly lined up and, in all probability the same coupling may be used. It can be shimmed up by inserting a brass plate underneath, either bolted through the magneto bracket or held by the strap now in use. The four wires from the distributor posts will lead to the four spark plugs, another wire from the post on the front plate to the switch and another from the switch to the frame of the car, as shown in Fig. 28. This is all the wiring necessary. This will eliminate all your other ignition wiring and use of the coil.

The switch is needed to stop the engine, and this is accomplished by closing the switch to ground the current or deflect it from the magneto. You could do this by having a single wire leading from the magneto distributor plate to any convenient place and by merely touching the wire to any metal part. This will ground the current and prevent ignition. The wires from the distributor posts to the plugs must be high-tension current, whereas the wire from the back plate post to the switch need only carry a low-tension current.

In setting the magneto for timing, retard the spark lever fully, have the piston of No. 1 cylinder on top dead center on the compression stroke and set the breaker to begin opening at this point. You will have to do a little experimenting to get this right. When ordering the magneto ask for an instruction book, and this will tell just how it should be set. Do not, under any circumstances, tear down the magneto; the breaker and the distributor are set correctly in relation to one another.

### HIGH TENSION MAGNETO ON MOLINE UNIVERSAL

Q—Do you think it advisable to install a high-tension magneto on a model D Moline Universal; the present system seems to give considerable trouble.

2—Could the magneto be run on the distributor shaft, or is it too light for the work?

3—Should I use an impulse starter, also?—L. J. Hines, Lake Charles, La.

1—A high-tension magneto would be reliable and very satisfactory. It can be run on either the distributor shaft or the pump shaft. Fig. 30 shows that the magneto can be driven from the generator shaft.

2—See 1.

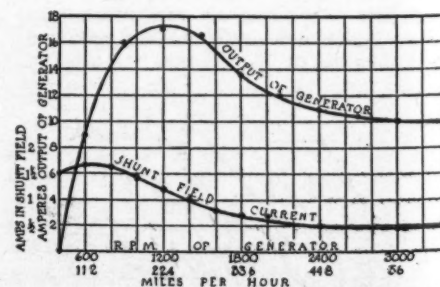


Fig. 26—Curves showing relation of shunt current and delivered current to the Speed of car in miles per hour and speed of generator in revolutions per minute for a Delco third-brush generator



3—The magneto company from which you decide to purchase your high-tension ignition system will be able to furnish all necessary information or impulse starters.

### EFFECT OF ADVANCED AND RETARDED SPARK

Q—Supposing engine is in good condition would it pull better on "advanced" or "retarded" spark in negotiating a grade in high gear at a speed of approximately ten miles per hour. Or, on a hard pull in "high" or "low" at engine speed of 500 r.p.m.? Explain why.—Pershing Garage, Pershing, Okla.

1—In timing an engine it is necessary to have the spark occur at a certain point in the cycle in order to develop maximum power. Under average driving conditions the ignition takes place at a point of about maximum compression. When a car is under a heavy pull the effect of the pressure on the piston when it is in a certain position causes a decided knock. The spark is retarded to change the point of ignition and to reduce the pressure within the cylinder. This causes a great reduction of power because it lowers the pressure and rate of combustion and causes a great heat loss to the cylinder walls.

### USING AN APELCO GENERATOR FOR GARAGE LIGHTING

Q—An Apelco generator which has been taken off of a 1914 Marathon car is only stamped with model and generator number. What would be the voltage and amperage at a speed of 1500 r.p.m.?

2—How many storage batteries 6-volt type could be charged with this Apelco generator?

3—In fixing up a lighting system for our garage how many lamps could be used with this generator?—Wedlund Bros. Garage, Bingham Lake, Minn.

1—This generator gives about 10 amperes and 6 volts at 1500 r.p.m.

2—It has capacity enough to charge two storage batteries at a charging rate of 4 or 5 amperes.

3—This generator is built to run a lighting system for a garage and an attempt to make such an installation would prove very unsatisfactory. It cannot operate successfully or efficiently with an output of more than about 75 watts and this would not be sufficient to light your garage.

### STARTING TROUBLE ON HUPMOBILE

Q—A model N Hupmobile, car number 63249 has been easy to start until lately. Now it is not possible to start it without heating the carburetor. After this has been done it starts easily and runs fine. It is equipped with the auxiliary Bosch magneto ignition and both systems work well. Also compression is very good. Can you locate the trouble?—Lloyd Love, Orion, Ill.

Since the engine started easily before we are inclined to believe that the trouble is caused by poor compression, even though you say the compression is good. The compression on these engines should be about 68 lb. and if the cylinders do not measure up this amount you are losing the mixture either at the valve or through the rings. It might be that the compression is good and that the spark is weak. If the spark plugs are set the gap is larger than 0.025 in., the gap is too large. This will cause hard starting.

### MAGNETO CHARGING APPARATUS

Q—Instruct how to make a magneto charging apparatus for 250 volts direct current.—Melvin R. Yoho, Byesville, Ohio.

In the February 12 issue of MOTOR AGE there is a complete design of a magneto charging outfit with instructions for building it. This outfit is for use on 110-volt circuit but can be used with 250 volts if enough resistance is connected in series to cut down the voltage. Make a lamp-bank with five or six lamps in parallel and connect it in series with the coils of the charging apparatus. This will cut down the voltage sufficiently to protect the coils but will operate very in-

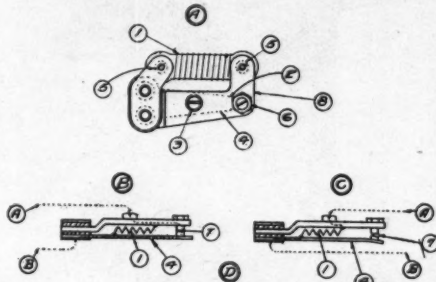


Fig. 27—The thermostat connections as system

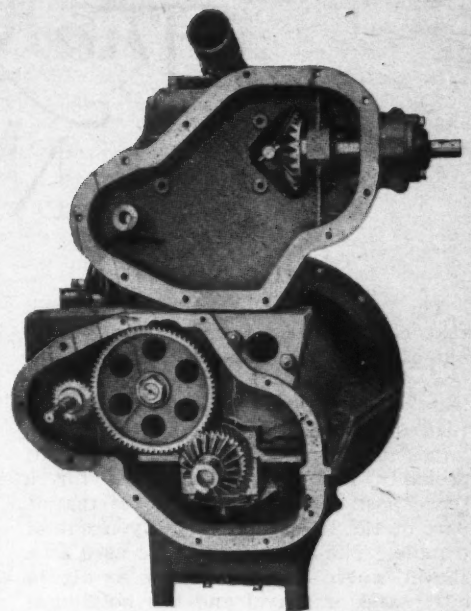


Fig. 30—The engine used in the Moline Universal

efficiently. Efficiency is of very little importance in magneto charging because it is only a momentary operation.

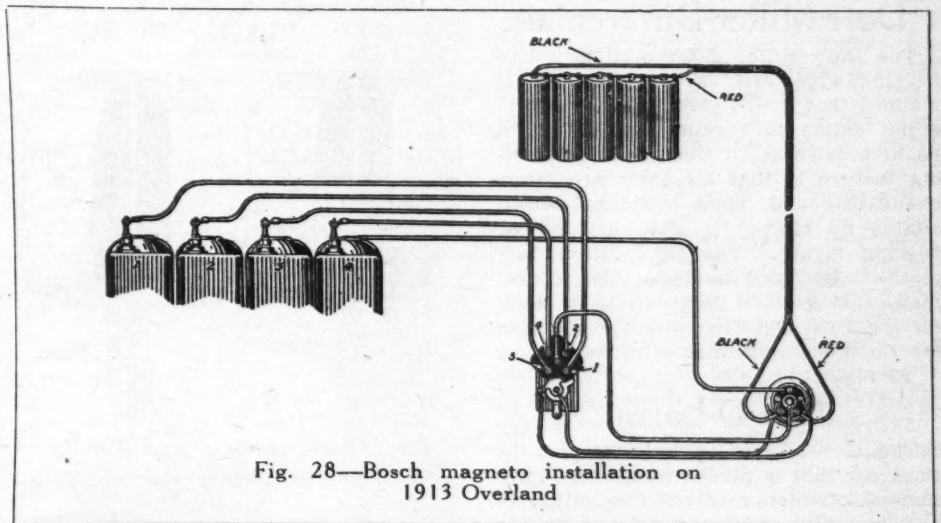
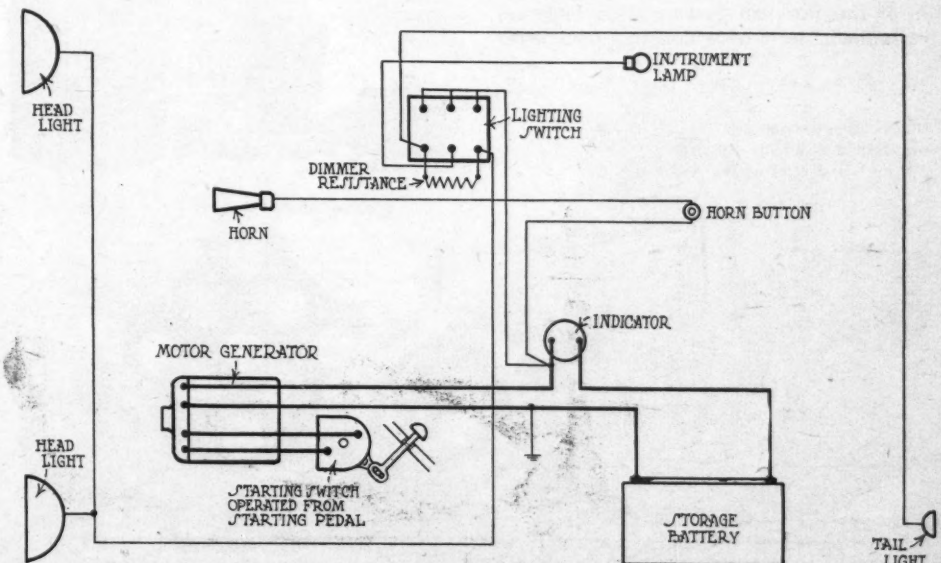


Fig. 28—Bosch magneto installation on 1913 Overland



NORTH EAST MODEL D

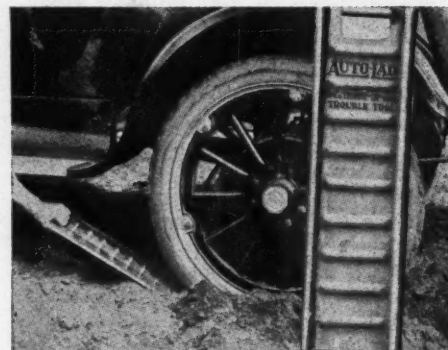
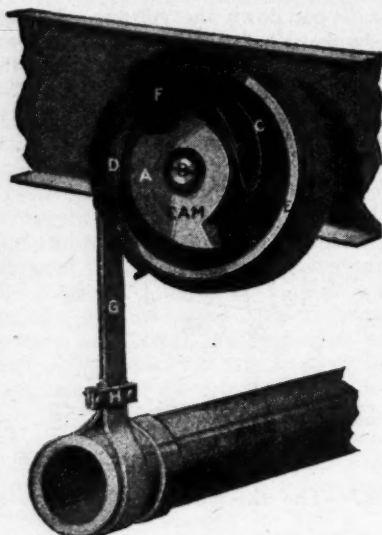
Fig. 29—Northeast system as used on Dodge

# The Accessory Corner

## New Fitments for the Car

### Auto-Lad

The Auto-Lad is a handy trouble tool that can be carried under the cushion out of the way and is always ready for use. When you are not prepared and least expect it you will skid off of the road into a deep mud hole, where it is impossible to get traction and you will probably find yourself looking for a fence post or some other device that is part of the landscape to get you out of trouble. The Auto-Lad can be used as a shovel where it is necessary to dig in mire sand or gravel and has horizontal grips or corrugations that will furnish traction for the wheels. It may also be used as a foundation for the jack when it has to be used on soft ground. It is manufactured by the Alsteel Mfg. Co., Battle Creek, Mich., and sells for \$1.50.

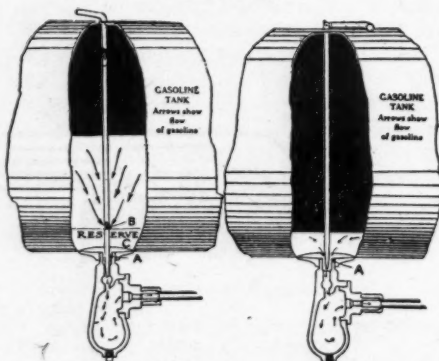


Auto-Lad to get you out of the bad places

### Dorr Miller Differential

The Dorr Miller differential is a ball bearing type and is gearless. It is claimed that it will give a perfect differential action in turning and deliver a positive drive at all times. An interesting feature is that all parts are interchangeable and when installing necessitates no change in axle housing or bearing layout. The Dorr Miller Differential Co., 5501 Lakeside Ave., Cleveland, carries this differential in stock for the Ford and Chevrolet 490 and also for the Ford worm-drive trucks.

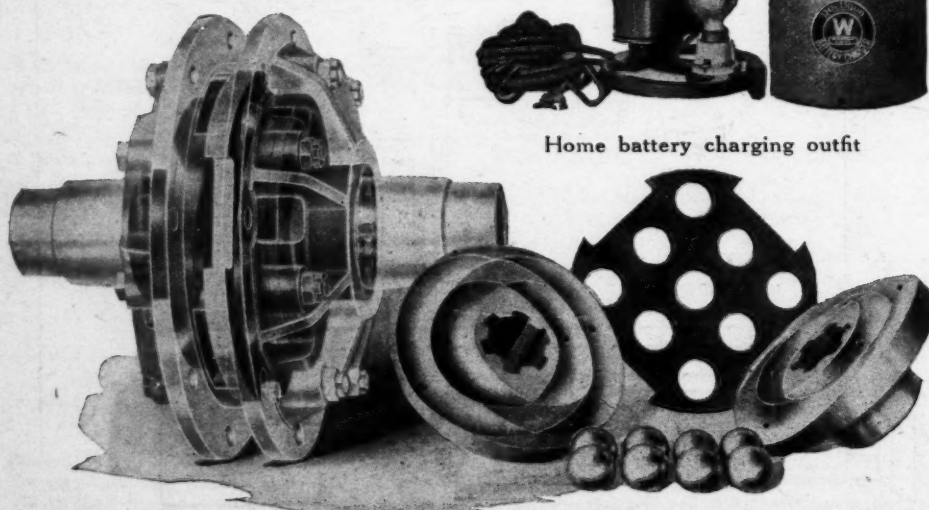
Velvet recoil deadener to check rebound



Gas-O-Larm to warn you that the gasoline supply is low

### Gas-O-Larm

The Gas-O-Larm is a device for the Ford car that is placed within the gasoline tank which reserves one gallon of gasoline. By turning the lever on the top of the tank an extra gallon becomes available. The device consists of a lever



Dorr-Miller differential is of the ball bearing type and gearless

### New Battery Charging Outfit

The Westinghouse Electric & Mfg. Co., Pittsburgh, have placed on the market a new battery charging outfit moderate in price, economical and safe in operation, light in weight, and convenient to handle. It is provided with a flexible extension cord and plug and can be connected to any ordinary house lighting circuit. This will enable the man who has no service station or garage near enough at hand to take care of his batteries and to charge his own battery without removing it from his car.



Home battery charging outfit

### The Velvet Recoil Deadener

It is claimed that the Velvet Recoil Deadener will work as fast as the main spring of the car can vibrate. This keeps the strap on the deadener taut, thereby absorbing all of the bumps and preventing a jerk when the car passes over several bumps in succession. This device does not bring the car to an abrupt dead stop. It is composed of a cam and drum and springs which wind up on the drum as shown in the illustration. The device in operating always keeps the strap taut, which prevents it from breaking. It is manufactured by Black Lead Mfg. Co., 341 East Ohio St., Chicago.

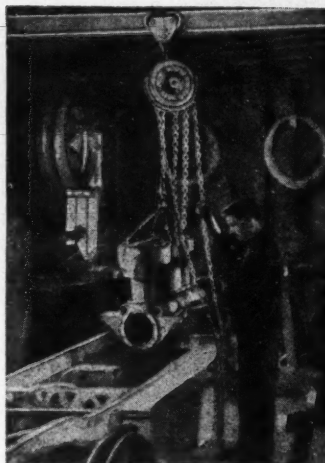


# Service Equipment

## Time Savers of the Shop

### The Rees Jack

The Rees Jack manufactured by the Iron City Products Co., Pittsburgh, Pa., is a most efficient tool in the garage or repair shop where trucks and tractors are handled. The ten-ton model, shown in the illustration, was the model used as a part of the standard equipment of the tank and tractor fleets of the United States Army during the war. It is of simple construction and has only four moving parts. The double worm gear drive which is the leading feature divides the load between two pinions and does away with excessive end thrust on the worm and side thrust on the lifting rack. The jack is easily taken apart and broken parts may be replaced at a low cost.



### Wagner Auto Creeper

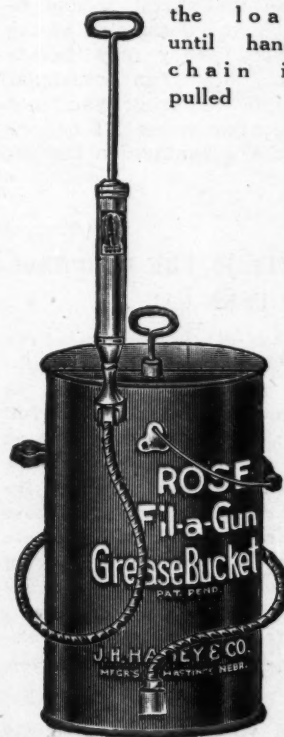
This is a creeper that is designed to aid the mechanic greatly in his work while lying under the car. It is equipped with a leather cushion headrest, and also a tool tray which is screwed along the side of the creeper to make it possible for the mechanic to have his tools in one certain place without feeling all over the ground in order to locate them. Large casters are fitted to this creeper which make it very easily moved. It is manufactured by the Wagner Mfg. Co. of Cedar Falls, Iowa.



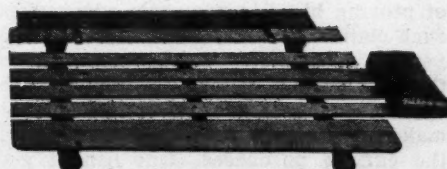
Ten-ton model Rees jack for trucks and tractors

Yale chain blocks for comparatively light service. It is the locking

type and will hold the load until hand chain is pulled



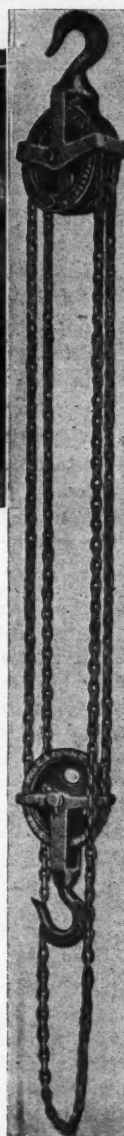
Rose grease gun bucket for facilitating the filling of grease guns



Wagner creeper has a leather cushion headrest and a tool tray

### Yale Chain Blocks

Yale differential blocks is for occasional service where comparatively light loads must be handled infrequently. The overhaul of hand chain compares with the Yale block, but the hand chain pull is greater by  $2\frac{1}{4}$  times. The block, however, is light and where men are available for emergency or occasional work especially in smaller sizes it is a desirable block. It is of the locking type and will hold the load until the hand chain is pulled.

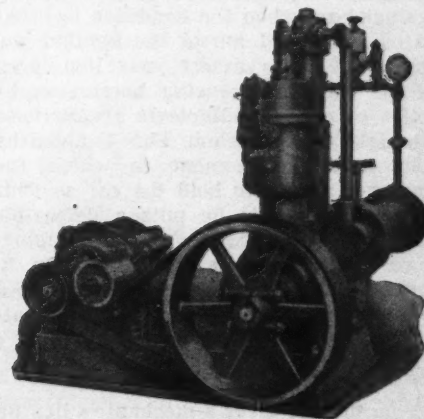


### Rose Grease Gun Bucket

The J. H. Haney & Co., Hastings, Neb., is introducing a new grease bucket, the purpose of which is to enable the mechanic to rapidly fill a grease gun by placing the gun on the end of the tube of the grease bucket and filling it by operating the plunger of the container. This bucket does away with the old system of pail and paddle of filling a grease gun and makes it unnecessary to smear grease on every piece of mechanism within reach after filling a grease gun up.

### Gardner High-Pressure Air Pump

With the coming of pneumatic equipment on large trucks it is found that the air compressor installation in the ordinary service station is not capable of supplying air at high enough pressure. To meet this demand the Gardner Governor Company of Quincy, Ill., has recently announced a new series of designs in pumps that will supply air under high pressure for pneumatic truck tires. Pressures up to 600 lb. can be obtained with these pumps. The pump shown in the illustration is a small motor-driven affair and is of the two-stage type. All parts are enclosed and therefore are free from dust.



Gardner high-pressure air pump for supplying air to the large pneumatic tires on trucks

# Law in Your Business

By Wellington Gustin



## COLLECTING PAYMENT AFTER THE CAR HAS LEFT THE GARAGE

Editor Motor Age—Some time ago you published an article relating to mechanic's lien and other matters regarding collection of accounts. We were very much interested in one form of lien which you mentioned. For example, if we allow a car against which we have an account to leave the garage, can we collect this bill if we have the owner's signature to an agreement to hold the car as our property until account is paid in full and also to turn the car over to us on twenty-four hours' notice at any time we demand it until account is paid. Will this method stand law in Wisconsin?—Babcock Garage, Babcock, Wis.

We are giving below a report which will answer your letter of recent date regarding mechanics' lien, etc., the car repaired by you having left the garage.

If you will look at your Wisconsin laws of 1917, page 446, Chapter 266, which you can see at your lawyer's office, you will find the amended provision of your statute upon mechanics' liens, more generally known as artisan's lien. The term mechanic's lien is usually applied to liens against real property and not to chattels or personality.

I do not believe the proposition you present has ever been passed upon squarely by your Supreme Court. But from its other decisions I am of the opinion that this method would be upheld in your state. Here your customer takes possession of the car on condition, agreeing to preserve your lien, and as against him, when the condition is broken or fulfilled, I am of the opinion you have a right to assert your lien, even to the point of securing possession by action of replevin. Replevin always tries the right to possession. This is aided by your written agreement in which the customer agrees to hold the car as your property. By this he puts a defeasible title in you, similar to a chattel mortgage. This certainly creates a lien in your favor, and you should file or record this with the proper official, like a chattel mortgage, which is necessary to give notice to third parties.

Your statute gives a mechanic's lien up to \$75.00 prior right to a chattel mortgage. However, a question is presented should your customer take his car to

**S**EEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. *MOTOR AGE* presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted him.

another garage where possession is held under another mechanic's lien. But I shall not attempt to answer this here. Now, of course, the surest means of safety is to retain the possession of the car. But business policy may dictate otherwise to you, and if an occasional customer attempts to bring you into court over your arrangement, I believe you will have the advantage to his regrets.

## SECURING TITLE IN THE PURCHASE OF USED CAR

Editor Motor Age—In buying a used car what procedure is adopted to secure protection against unrightful owner, or in other words, in securing good and full title to the car; also in selling a car on time payments, outline the usual course in securing the seller, kind of legal instruments used, etc. If this question goes beyond your sphere, can you advise where information that will serve one buying and selling cars may be had? I think publishing houses must have covered this phase of the automobile business long before this stage.—K. Simmons, Spokane, Wash.

You will find your greatest difficulty in protecting yourself against the rightful owner as the law places the burden of proving his title upon one who makes such claim. Now in purchasing a car the general rule is that one cannot pass to the purchaser a better title than he, the seller, holds. Hence the buyer should make sure of the title or ownership of the car he purchases. One cannot get good title to a stolen car, nor to one against which there is a recorded chattel

mortgage, or other valid lien. Many buy cars under a conditional sales contract in which the title is reserved in the seller until the buyer has made all the payments. Most states require that these conditional sales contracts be recorded in the county where the owner resides and the property is kept, in order to be valid against sales to third parties by the conditional purchaser.

The usual written instrument for passing title to a car in a sales transaction, is the ordinary bill of sale. In buying a car you should see that this contract expresses your exact agreement, that the seller warrants the title and agrees to defend said title in case another attempts to assert a paramount title. No form of agreement is required but you will find the bill of sale contract a convenient form and easiest to obtain from your printer or stationery store.

You will see that it is up to you to make certain as to the ownership of the car you purchase. If the seller can present a valid and genuine bill of sale to himself, you are safe. But these can be forged. If you are satisfied as to the ownership then the law requires one to search the records in the Recorder's office to see if there are any existing claims or liens recorded against the car, because a recorded claim is made notice to all the world.

In selling a car the buyer is the one to exact the contract embodying the provisions that he requires, and as agreed upon. If there is a possibility of dispute, it is always best to have a written agreement embodying the provisions. Oral provisions are often hard to prove. You will find the bill of sale handy to use, adding to or striking out certain provisions agreed upon. So you will have these printed forms on hand ready to execute when you make a sale. No instruments are really necessary in making a sale, though experiences show they are best and safest for both parties.

Where credit is extended the purchaser it is common to take promissory notes to cover the balance due on the property, payable in installments, the notes being secured by a chattel mortgage on the property. Another way is to draw up a conditional sales contract, reserving title until the notes are paid in full. Either of these instruments should be recorded to preserve your rights against third parties.



# The Automotive Repair Shop

## Practical Maintenance Hints

### What Do You Do With Your Old Files?

You may have a half dozen or more old files of various shapes and sizes lying around that are useless for their intended purpose.

The steel in these tools makes them especially adaptable for purposes where a hard sharp cutting edge is required.

A serviceable reamer for cutting steel brass or wood is made from a triangular file as shown in the sketch. The faces are ground smooth and a handle of a piece of pipe affixed to the twang. The tapering edges which are carried to a point at the extreme end adapt the reamer to various sizes of holes.

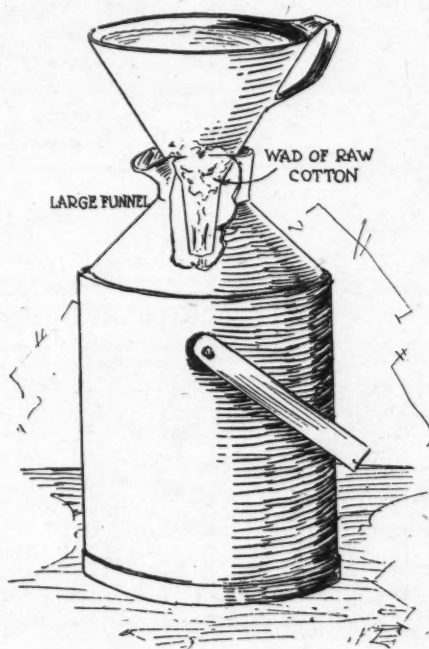
A counter sink is made in much the same manner by attaching a handle to a flat file and grinding cutting lips at an angle of 45 deg. to the sides. The handle can of course be left off and the twang be cut down to fit the breast drill. This tool is useful for putting in countersunk head rivets, bolts and screws.

A pair of tin snips made from two old files and two handles involves considerable grinding to bring the steel down to the desired shape, but are excellent cutters and especially adapted to small, fine work.

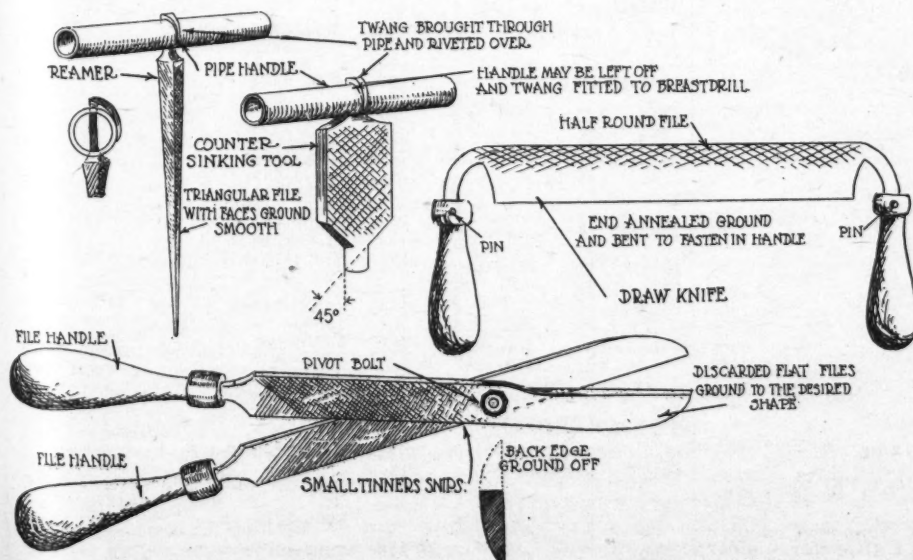
Another tool is a half-round file converted into a small draw knife. The point of the file was softened and ground to fit into a file handle and a similar handle fitted to the twang. The handles were further fastened against pulling off by two drilled in pins. Suitable grinding of the cutting edges made a tool with a finely tempered cutting face suitable for even the hardest of woods.

While those items mentioned are a few suggestions there are apparently no limits to the usefulness of the discard file. Other features in which the fine grade of steel from which the file is made find a usefulness are scrapers, scribers, small chisels, drills, knives, straight edges, tack pullers, etc.

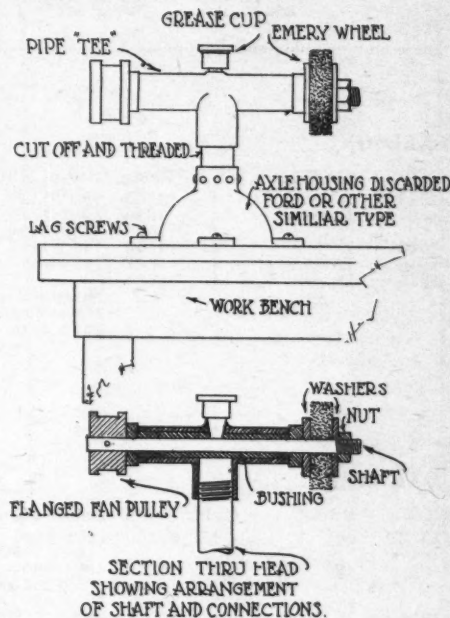
When in need of some special tool look first into the tool kit in search of a worn out file, it probably will answer your purpose.



Filtering liquids with a funnel and raw cotton



Here are some very useful tools which can be made from your old files



Using an old axle housing for a shop grinder bench

### Axle Housing, Stand for Shop Grinder

One section of a discarded axle housing makes a rigid stand or base for a bench grinder when arranged as shown in the illustration.

Cut the housing off to about 12 in. in length and thread the end for a pipe 'tee.' Bush the section through which the shaft is to run, and drill for a grease cup. A fan pulley can frequently be found that provides the belt drive connection. The grinding or emery wheel is secured to the opposite end of the shaft by means of two washers and a nut.

This fixture should be mounted on the work bench convenient to the workman. It is advisable if only one grindstone is used in the shop, in some remote corner, to make one of these grinders for each work bench. Considerable time will be saved daily as it will save those frequent trips to the out-of-way grindstone.

### Filtering Liquids with Funnel and Raw Cotton

A filtering method that requires no preliminary preparation, is to drop a wad of raw cotton into the spout of a large funnel. Set the funnel over any available can and pour in the liquids. Oil, kerosene, gasoline and washing solutions will come through clear and clean.

# Passenger Car Serial Numbers

## Motor Age Maintenance Data Sheet No. 90

One of a series of weekly pages of information valuable to service men and dealers—save this page

### NELSON

Year	Model	Cyls.	Price	Serial Numbers
1917	A	4	\$1800	1001-1082
	BB	4	1290	1004-1125
	C	4	1400	1059-1101
1918	D	4	1450	1112-1187
1919	D	4	1500	1188 up
1920	D	4	1700	

Number on dash plate; engine number top of right front crank-case arm.

### OAKLAND

Year	Model	Cyls.	Price	Serial Numbers
1912	30	4	\$1200	7001-8000
	40	4	1450	11001-11500
	45	4	2100	8001-9000
1913	35	4	1075	9650-11000
	42	4	1600	9001-9500
	60	6	2400	35001-37500
1914	36	4	1200	40001-43601
	48	6	1785	60001-60951
1915	62	6	2500	360000-364000
	37	4	1200	480000-481150
	49	6	1685	620000-620100
1916	32	6	795	370000-373599
	38	4	1050	490000-490500
1916-17	50	8	1585	Number on front heel board
				320000-328000
				330000-347100
				380000-384001
				500000-502000
				Number on heel board of driver's compartment, or on left rear cross frame member.
1917	34	6	875	134-3000034
1918	34-B	6	-----	3000134 up
1919	34-B	6	-----	11699934
1920	34-C	6	1075	11700134 up
				1918 number on heel board; 1919 on heel board and on right rear side member.

### OLDSMOBILE

Year	Model	Cyls.	Price	Serial Numbers
1913	40	4	\$2500	80325-80999
	53	6	3200	81000-81500
1914	54	6	2975	83000-83999
	42	4	1285	84001-84399
1915	42	4	1285	84500-92499
	55	6	2975	92500-92999
1916	43	4	1095	93000-93999
	43	4	1095	109000-109499
	44	8	1195	109500-118782
			1775	1850
1917	45	8	1775	1295
			1850	119000-135276
			1367	1295
	45	8	1295	143000-144500
			-----	148900-148925
	37	6	1095	150000 up
			1675	192000-200000
			1295	1700
1918	45A	8	1700	135277-142999
				145000-149999
1919	37A	6	1395	37AT1 & 37AR1 up
			1895	37AS1 & 37AC1 up
1920	45B	8	1895	45BT1, 45BP1 & 45BS1 up
	37A	6	1395	
	45B	8	2045	

Number under front seat cushion or on dash, right side, under hood.

### OVERLAND

Year	Model	Cyls.	Price	Serial Numbers
1912	58	4	-----	1-250
	59	4	-----	1-13250
	60	4	-----	1-6656
	61	4	-----	1-2300
1913	69	4	-----	1-26354
	71	4	-----	1-3000
1914	79	4	-----	1-44995
1915	80	4	-----	1-19993
	81	4	-----	1-20399
	82	6	-----	1-2846
1916	84	4	-----	1-14080
	86	6	-----	1-12008
	83 & 83B	4	-----	1-101976
1916-17	75 & 75B	4	-----	1-65693
1917-18	83 B. O. E.	4	-----	
	85-4	4	-----	1-51892
	85-6	6	-----	1-18459
	90 & 90B	4	-----	1

Number under front seat cushion, stamped on front spring right hanger, or front end right side frame rail, except model 90, which is on right rear frame end. 109-31000

1919 4 4 \$845  
1920 4 4 945

Number on left frame.

### PACKARD

Year	Model	Cyls.	Price	Serial Numbers
1912	30	4	\$4200	20001-23000
	48	-----	-----	23001-26000
	18	4	3200	26001-27000
1913	48	6	4850	35026-38000
1914	1-38	6	4150	38000-42000
	48	6	4850	50026-52000
	2-38	6	3350	53026-56000
	48	-----	-----	63028-66000
1915	3-38	6	3750	75026-76999
	5-48	6	4850	78026-78386
1916	1-25	12	2750	80026-90000
	1-35	12	-----	125051-150000
	2-25	12	-----	
	2-35	12	-----	
1917	2-25	12	3050	
	2-35	12	3500	
1918	3-25	12	3700	150051 up
	3-35	12	4100	
1919	3-25	12	3950	
	3-35	12	4300	
1920	3-25	12	-----	
	3-35	12	-----	

Number on right front frame.

### PAIGE

Year	Model	Cyls.	Price	Serial Numbers
1911-12	25	4	\$975	3000-4499
			1000	
1912-13	25	4	975	4500-6999
			1000	
1913	25	4	975	7000-9170
1914	25	4	975	9171-9999
1913-14	36	4	1275	10001-14000
1914-15	36	4	1075	14000-20000
	46	6	1395	55000-59999
1915-16	36	6	1095	80000-81500
	46	6	1295	60000-66000
1916-18	46	6	1375	65600-69999
	38	6	1090	85000-89923
1917-18	39	-----	1330	89924-101999
1918	39	6	1395	102001 up
	39	6	1690	102001 up
1917-18	51	6	1495	70000-74999
	55	6	2060	75000-79500
1919	55	6	2060	82001 up
	55	6	2165	82001 up

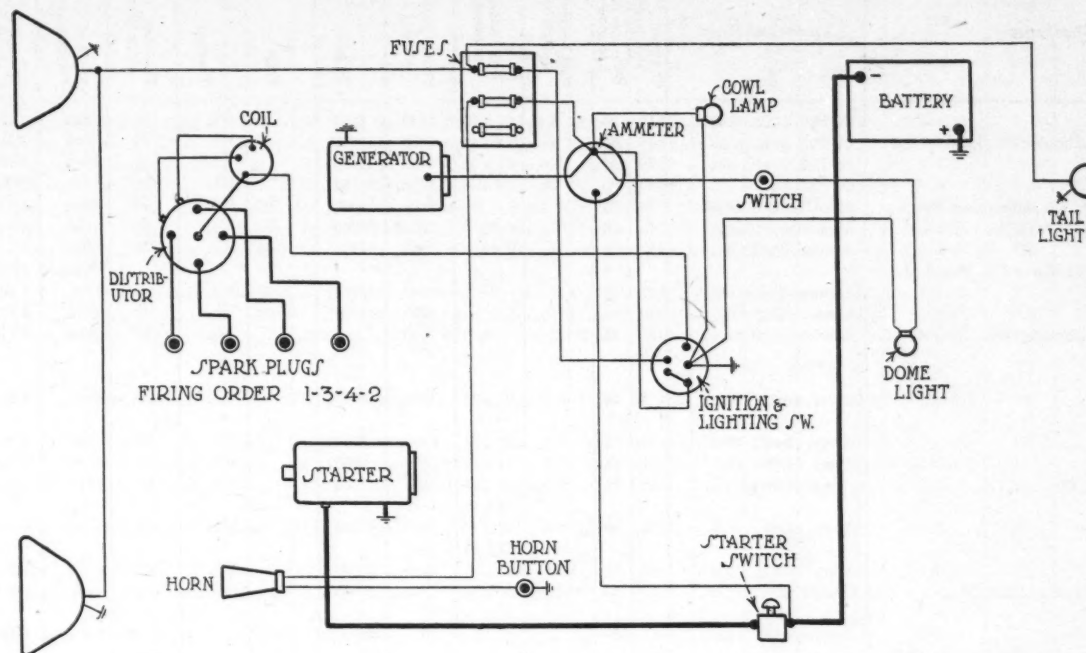
Number plate under left front seat cushion

### PAN-AMERICAN

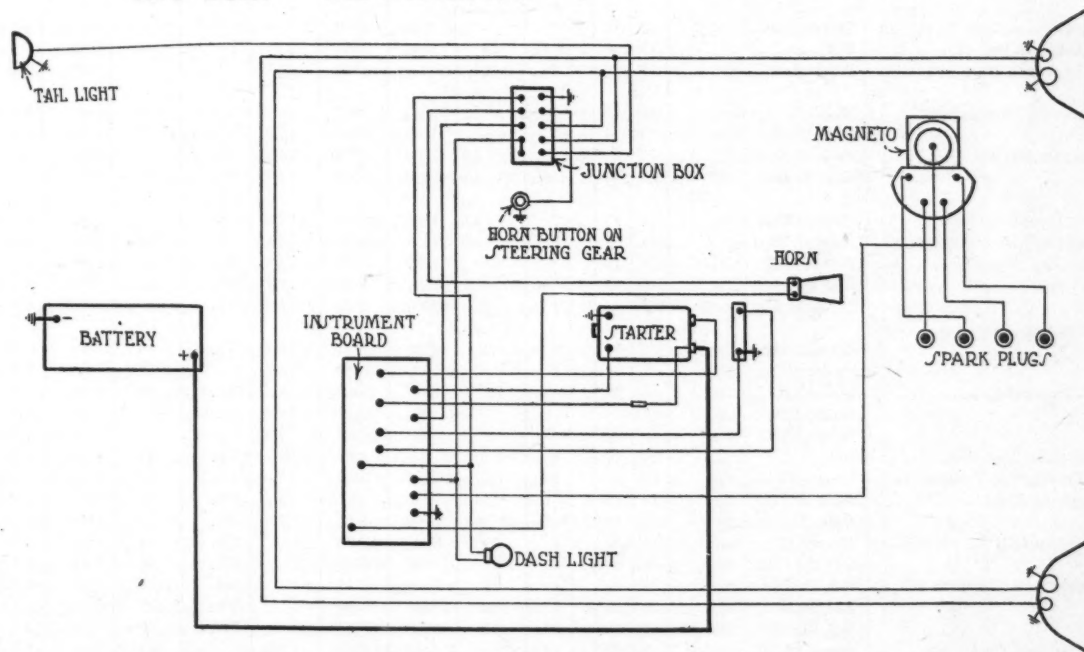
Year	Model	Cyls.	Price	Serial Numbers
1918	E-6-48	6	\$1800	500-1200
				Number on frame horn
1919	E-6-48	6	-----	3000-3322
	F-6-48	6	-----	
	G-6-48	6	-----	
1920		6	2150	3314 up
				Number on cowl plate



# Motor Age Weekly Wiring Chart No. 70



1919 DORT WESTINGHOUSE



1917 MERCER U.S.L. ELECTRIC BOSCH IGNITION

## THIS WEEK

1919—Dort  
1917—Mercer

Allen—Dec. 18, '19  
Auburn—Nov. 27, '19  
Briscoe—Oct. 16, '19  
Bulck—Oct. 23, '19  
Case—Oct. 2, '19  
Crow-Elkhart—June 26, '19  
Chalmers—Nov. 27, '19  
Cutting—Nov. 6, '19  
Daniels—Dec. 4, '19  
Davis—Dec. 4, '19  
Dorris—Dec. 11, '19  
Empire—Oct. 30, '19  
Essex—Oct. 23, '19  
May 15-22, '19  
Franklin—June 19, '19; Dec. 11, '19  
General Battery Charging—Sept. 25, '19

General Magneto Diagram—June 5, '19  
Haynes—Oct. 9, '19  
Hupmobile—Oct. 16, '19  
Internal Connections—July 10-17-24, '19  
Keeton—Nov. 6, '19  
King—July 3, '19  
Kissel—July 3, '19  
Lexington—Jan. 1, '20  
Liberty—Jan. 1, '20  
Marmon—Dec. 25, '19; Jan. 22, '20  
Maxwell—Aug. 14, '19  
Mercer—Aug. 28, '19; Nov. 27, '19  
Mitchell—Jan. 8, '20  
Monroe—Oct. 30, '19  
Moon—Jan. 29, '20; March 11, '20  
Moore—March 4, '20  
Nash—March 11, '20  
National—June 19, '19; Feb. 12, '20  
Oakland—Oct. 16, '19  
Olympian—Jan. 22, '20  
Owen Magnetic—Sept. 18, '19

Packard—June 19, '19; July 31, '19; March 18, '19  
Palge—July 3, '19  
Paterson—June 26, '19; July 9, '19  
Pierce-Arrow—Oct. 2, '19; Feb. 5, '20  
Pilot—March 4, '20  
Premier—Dec. 18, '19; Feb. 26, '20  
Reo—Aug. 21, '19; Oct. 9, '19; Nov. 13, '19  
Roamer—March 18, '20  
Scripps-Booth—Jan. 15, '20  
Stanley—June 26, '19  
Stearns-Knight—Jan. 8, '20  
Stephens—Feb. 12, '20  
Studebaker—Dec. 25, '19  
Stutz—Feb. 5, '20  
Templar—Jan. 29, '20  
Velle—Sept. 25, '19; Feb. 19, '20  
Westcott—Jan. 15, '20  
White—Sept. 25, '19; Feb. 19, '20  
Willys-Knight—Feb. 26, '20  
Special Systems for Fords—May 15-22, '19

## Motor Age Monthly Guide to Tractors

Line No.	Manufacturer	Tractor and Model	Drawbar horsepower	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. P. M.	
1	Advance-Rumely Thresher Co., Laporte, Ind.	Oil Pull.....	12	20	3	22 x 36	2150	6682		Wh.	51	Own	2 Hor.	6 x 8	560	
2		Oil Pull.....	16	30	4	28 x 44	2850	9600		Wh.	56	Own	2 Hor.	7 x 8½	530	
3		Oil Pull.....	20	40	5-6	32 x 52	3750	12820		Wh.	64	Own	2 Hor.	8 x 10	450	
4	Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Oil Pull.....	30	60	8-10	36 x 60	5900	26700		Wh.	80	Own	2 Hor.	10 x 12	375	
5		Allis-Chalmers, 18-30.....	18	30	3-4		3000	6000	\$1,785	Wh.	50	Own	4 Ver.	4¾ x 6½	830	
6		Appleton Mfg. Co., Batavia, Ill.	Appleton.....	12	20	2-3	22	2000	4900	1,650	Wh.	54	Buda	4 Ver.	4¼ x 5½	1000
7	Aultman-Taylor Machinery Co., Mansfield, O.	Aultman-Taylor.....	15	30	4	28	2800	7500	2,300	Wh.	70	Clim.		5 x 6½	900	
8		Aultman-Taylor.....	22	45	6	32	4800	13000	3,700	Wh.	70	Own	4 Ver.	4¾ x 6¾		
9		Aultman-Taylor.....	30	60	8-12		8000	23000	4,800	Wh.	90	Own	4 Hor.	7 x 9	500	
10	Automotive Corp., Toledo, Ohio.....	Automotive, B-B.....	12	25	2	30	1800			Wh.	40	Herc.	4 Ver.	4 x 5½	1000	
11																
12																
13	Avery Co., Peoria, Ill.	Avery, 8-16.....	8	16	2-3	22 x 32	1800	4900		Wh.	50	Own	2 Hor.	5½ x 6	600-750	
14																
15		Avery, 12-25.....	12	25	3-4	20 x 30	2800	7500		Wh.	56	Own	2 Hor.	6½ x 7	600-700	
16		Avery, 14-28.....	14	28	3-4	24 x 36	3000	6800		Wh.	60	Own	4 Hor.	4¾ x 7	700-900	
17		Avery, 18-36.....	18	36	4-5	24 x 36	3500	9250		Wh.	65	Own	4 Hor.	5½ x 6	650-750	
18					28 x 46											
19		Avery, 25-50.....	25	50	5-6	28 x 46	4800	12500		Wh.	69	Own	4 Hor.	6½ x 7	600-700	
20						32 x 54										
21		Avery, 40-80.....	40	80	8-10	36 x 60	7600	22000		Wh.	87½	Own	4 Hor.	7¾ x 8	500-600	
22		Steel Mule.....	15	22	3	26 x 36		4600		Cr.		Erd	4 Ver.	4¼ x 6	900	
23	C. L. Best Gas Trac. Co., San Leandro, Calif.	Tracklayer, B.....	12	25	3		2000	5100	2,600	Cr.		Own	4 Ver.	4¾ x 5¼	850	
24		Tracklayer, A.....	35	60	9		6500	17500	5,750	Cr.		Own	4 Ver.	6½ x 3½	650	
25																
26	Buckeye Mfg. Co., Anderson, Ind.	Trundaar, 10.....	25	40	4		3750	8800	3,750	Ch. T.		Wauk.	4 Ver.	5 x 6¼	900	
27	Bull Tractor Co., Anderson, Ind.	Bull.....	12	24	2-3	26	1000	4996	1,200		60	Toro	2 Hor.	5½ x 7	750	
28	Burn-Oil Tractor Co., Peoria, Ill.	Burn-Oil, A.....	15	30	3	26		5500	1,550		56	Own	2 Hor.	6¾ x 7	700	
29																
30	J. I. Case Plow Works Co., Racine, Wis.	Wallis, K.....	15	25	3		2000	3560		Wh.	48	Own	4 Ver.	4¼ x 5¾	850	
31	J. I. Case T. M. Co., Racine, Wis.	Case, 10-18.....	10	18	2	20 x 28	1665	3400	1,200	Wh.	42	Own	4 Ver.	3¾ x 5	1050	
32		Case, 15-27.....	15	27	3	20 x 36	2500	5750	1,600	Wh.	52	Own	4 Ver.	4½ x 6	900	
33		Case, 22-40.....	22	40	4-6	26 x 46	3428	9500	2,600	Wh.	56	Own	4 Ver.	5½ x 6¾	850	
34																
35	Cleveland Trac. Co., Cleveland, Ohio.	Cletrac, W.....	12	20	2	24 x 40	1285	3400	1,395	Cr.		Own	4 Ver.	4 x 5½	1265	
36	Coteman Trac. Sales Co., Kansas City, Mo.	Coleman.....	16	30	3	28 x 48	3000	5200	1,850		44	Clim.	4 Ver.	5 x 6½	7500	
37	Dart Truck & Trac. Corp., Waterloo, Ia.	Blue J, T. E.....	12	25	3	24	2250	4300	1,850	Wh.	42	Buda	4 Ver.	4¼ x 5½	1050	
38		Blue J.....	15	30	3-4	28	2500	4500	2,000	Wh.	42	Buda	4 Ver.	4½ x 6	1050	
39		Sandusky J.....	10	20	3	22	2000	4080	1,650	Wh.	48	Own	4 Ver.	4¼ x 5¼	1050	
40																
41	Dauch Mfg. Co., Sandusky, Ohio.....															
42		Sandusky, E.....	15	35	4	30	3500	7670	2,500	Wh.	56	Own	4 Ver.	5 x 6½	750	
43		Leader, B.....	12	24	2	20	2000	5200	1,285		48	Own	2 Hor.	6¼ x 6	800	
44		Leader.....	16	32	3-4	28	3500	5800	1,985	Wh.	54	Clim.	4 Ver.	5 x 6½	800	
45	Dayton-Dowd Co., Quincy, Ill.	Leader, C.....	18	36	3-4	28	4000	6500	2,495	Cr.		Twin	4 Ver.	5 x 7½	750	
46		Leader, CX.....	20	40	4-5	28	5000	6500	2,750	Cr.		Doman	4 Ver.	6 x 7	750	
47		Dill.....	20		3		4400	2,480	Wh.	42	Cont.	4 Ver.	4½ x 5½	900		
48	Dill Trac. Mfg. Co., Little Rock, Ark.	Dill.....	20		3		4400	2,480	Wh.	42	Cont.	4 Ver.	4½ x 5½	900		
49	Dubuque Trac. & Tr. Mfg. Co., Dubuque, Ia.	Klumb, F.....	16	32	3	28	3200	5250		Wh.	45	Clim.	4 Ver.	5 x 6½	800	
50	Eagle Mfg. Co., Appleton, Wis.	Eagle, F.....	12	22	2-3	24	2400	5850	1,290	Wh.	48	Own	2 Hor.	7 x 8	450	
51		Eagle, F.....	16	30	3-4	28 x 30	3200	7100	1,750	Wh.	52	Own	2 Hor.	8 x 8	450	
52		Allwork, C.....	14	28	3	28	3000	5000		Wh.	48	Own	4 Ver.	5 x 6	800	
53	Electric Wheel Co., Quincy, Ill.	E-B, Q.....	12	20	3	24	2000	6500		Wh.	60	Own	4 Ver.	4¾ x 5	850	
54		E-B, 12-20, AA.....	12	20	3	24	2600	4355		Wh.	54	Own	4 Ver.	4¾ x 5	900	
55		E-B, 20-35.....	20	35	5	28	3300	9700		Wh.	72	Own	4 Ver.	5¼ x 7	750	
56	Emmerson, Brantingham Co., Rockford, Ill.	E-B, Reeves.....	40	65	8-10	44	10000	22750		Wh.	90	Spec.	4 Ver.	7¼ x 9	500	
57																
58		Fageol Motors Co., Oakland, Calif.	Fageol, D.....	9	12	2		1450	3500	1,525		48	Lyc.	4 Ver.	3½ x 5	1250
59	Ford & Son, Inc., Henry, Dearborn, Mich.	Fordson.....	20		2	20 x 34	1800	2750	750	Wh.	42	Own	4 Ver.	4 x 5	1000	
60																
61	Four-Drive Trac. Co., Big Rapids, Mich.	Fitch, 4.....	20	35	3-4	28 x 30	3200	6000	3,000	Wh.	F- 36x12 R- 42x12		Clim.	4 Ver.	5 x 6½	850
62																
63	Franklin Trac. Co., Indianapolis, Ind.	Franklin, B.....	15	30	2-3	22 x 36	2500	3500		Cr.		Buda	4 Ver.	4¼ x 5½	1000	
64	Frick Co., Waynesboro, Pa.	Frick.....	12	24	3	22 x 26		5800		Wh.	60	Erd.	4 Ver.	4 x 6	900-1000	
65		Frick.....	15	30	3-4	26		6000		Wh.	60	Beav.	4 Ver.	4¾ x 6	900-1000	
66		G-O.....	14	28	8	30		4200	1,485	Wh.	46	Wauk.	4 Ver.	4¾ x 5¾	1000	
67	General Ordnance Co., Cedar Rapids, Ia.		9	16	2			4000	1,650	Cr.		Own	4 Ver.	4 x 4	1000	
68		Monarch.....	18	30	4	28	3300	8000	2,700	Cr.		Beav.	4 Ver.	4¾ x 6	900	
69	General Tractors, Inc., Chicago	Monarch.....	18	30	4	28	3300	8000	2,700	Cr.		Beav.	4 Ver.	4¾ x 6	900	
70	Gray Tractor Co., Minneapolis, Minn.	Gray.....	18	36	4		2700	6185			54	Wauk.	4 Ver.	4¾ x 6¾	850	
71	Hart-Parr Co., Charles City, Ia.	Hart-Parr, 30.....	30		3	28	3000	5570	1,395	Wh.	52	Own	2 Hor.	6½ x 7	750	
72																
73	Holt Mfg. Co., Peoria, Ill.	Caterpillar, 5-Ton.....	25	40	4	32 x 52	3100	9400		Cr.		Own	4 Ver.	4¾ x 6	1050	
74		Caterpillar, 10-Ton.....	40	60	6	40 x 60	5000	19000		Cr.		Own	4 Ver.	6½ x 7	700	
75		Holton Tractor Co., Indianapolis, Ind.	Holton, 2-A.....	10	16	2-12			2500	1,250	Wh.	42	Le Roi	4 Ver.	3½ x 4½	1250

Abbreviations: Traction—Wh. wheel; Cr. crawler. Engine—Beav. Beaver; Vee. Veerac; Herc. Hercules; Wauk. Waukesha; Buff. Buffalo; Asso. Associated Manufacturers; Auto. Automatic; Weid. Weldely; Clim. Climax; Twin Twin City; Cont. Continental; Ruten Rutenber; Over. Overland; Kenn. Kenneth. Cylinders—Ver. Vertical; Hor. horizontal; Opp. opposed. Fuel—G. gasoline; K. kerosene; D. distillate. Carburetor—Ray, Rayfield; King, Kingston; Hol. Holley; Scheb. Schebler; Ben. Bennett; Web. Webster; Zeph. Zephyr; Ens. Ensign; Strom. Stromberg; Till. Tillotson; Zen. Zenith; Car. Carter. Air-Cleaner—Donal. Donaldson; Ben. Bennett; Hol. Holley. Magneto—A-K, Atwater-Kent; Sun. Sumter; Eise. Eismann; Berl. Berling. Clutch—B. & B. Borg & Beck; Bier. Bierman; Mun. Muncie; Rock. Rockwood; spec. special. Gearset—B. & S. Brown & Sharpe; Nutt. Nuttall. Gear type—Sl. G., sliding gear; Sel. G., selective gear; Fr. friction; Plan. planetary; Sl. J. C., sliding jaw clutch. Final Drive—S. G., spur gear; Ch. chain; D. R. double reduction; B. G., bull gear. Drive—Op., open; In., inclosed.



## and Their Technical Specifications

Normal H. P. M.	Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
560	1	K-D	2 1/4-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Own	Hyatt	19	500	2790	2	2.1-3.26	2.1	S. G.	Op.	No.	1
530	2	K-D	2 1/4-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Own	Hyatt	23	530	3190	2	2.1-3	2.1	S. G.	Op.	No	2
450	3	K-D	2 3/4-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Own	Hyatt	26	450	3060	2	2-3.2	2	S. G.	Op.	No	3
375	4	K-D	3 1/4-Own	None	Bosch	Own	Own	Sl. G.	Own	Own	Own	Own	36	375	3540	1	1.9	1.9	S. G.	Op.	No	4
830	5	G-K	1 1/4-King	Ben.	Cpt.	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	15	830	3200	2	2.3-2.8	2.8			Yes	5
1009	6	G-K	1 1/4-Scheb.	Ben.	Bosch	B. & B.	Nutt	Sl. G.	Perfex	Hyatt	Own	Hyatt	7 1/2	825	2600	2	2 1/4-3 1/2		I. G.		Yes	6
900	7	G-K-D	1 3/4-King	Ben.	Eise.	Own	Own	Sl. G.	Hooven	Hyatt	Own	Hyatt	20	450	2400	1	2.2-2.49	2.5	I. G.		Yes	7
	8																				8	
600	9	G-K-D	2 -King		Eise.	Own	Own	Sl. G.	Own	Own	Own	Own	20	600	3150		1-2.93	2.13	B. G.		No	9
500	10	G-K-D	2 1/4-King.		Eise.	Own	Own		Own	Own	Own	Own	24	500	3150	2.2	1-2.2	2.2	B. G.		No	10
1000	11	G-K	1 1/4-King.	Ben.	Eise.	B. & B.	Own	Sl. G.	McCord	U.S. Gurney Hyatt	Timk.	Timk.	10	996	2600	2	2 1/4-4	2 1/4	I. G.	In.	Yes	11
	12																				12	
	13																				13	
600-750	14	G-K	1 1/4-King.		K-W	Own	Own	C. M.	Own		Own	Own	17 1/2	600	2750	2	1 3/4-3	1 3/4	S. G.	Op.		14
	15	D-A																			15	
600-700	16	G-K-D	1 1/4-King.		K-W	Own	Own	C. M.	Own		Own	Own	19 1/2	600	2910	2	1 3/4-2 3/4	1 3/4	S. G.	Op.		16
700-900	17	G-K-D	1 1/4-King.		K-W	Own	Own	C. M.	Own		Own	Own	16	700	2930	2	2 3/4-3 1/2	2	S. G.	Op.		17
650-750	18	G-K-D	1 1/4-King.		K-W	Own	Own	C. M.	Own		Own	Own	18	650	3065	2	2-3	2	S. G.	Op.		18
	19																				19	
600-700	20	G-K-D	2-King.		K-W	Own	Own	C. M.	Own		Own	Own	22	600	2880	2	2-3	2	S. G.	Op.		20
	21																				21	
500-600	22	G-K-D	2-King.		K-W	Own	Own	C. M.	Own		Own	Own	26	500	3400	2	1 3/4-2 3/4	1 3/4	S. G.	Op.		22
900	23	G-K-D	1 1/4-Ben.	Ben.	Dixie	B. & B.	Own	Sl. G.	Modine	Timk.	Timk.	T. & H.	12	725	2300	2	2.33-3.5	2.33	S. G.			23
	24																				24	
850	25	D	1 1/4-Ens.	Ben.	Split.	Own	Own	Sl. G.	Own	Hyatt Timk.		Hyatt	9	9000	1971	2	2 1/4-3	3	I. G.			25
	26																				26	
650	27	D	2-Ens.	Ben.	Bosch	Own	Own	Sl. G.	Own	Hyatt Timk.		Timk.	16	650	2720	2	3-2	3	I. G.			27
	28																				28	
900	29	G-K-D	-Strom.	Own	Bosch	Hill.	Own	Sl. G.	Modine	Opt.		H. & T.	900	2600	2	1.3-2.5		S. G.	In.		29	
750	30	G-K-D	1 1/4-King	Donald.	K-W		Own					Hyatt	12	750		1	2.4-2 3/4	2.4	B. G.			30
700	31	K	1 1/4-Scheb.	Ben.	K-W	Own	Own		Spec.	S.K.F. Hyatt	Hyatt	Hyatt	13	750	750	2	1 3/4-3	2 3/4	G.			31
	32																				32	
850	33	G-K-D	1 1/4-Ben.	Ben.	Bosch	Twin	Own	Sl. G.	Modine	Timk.	Hyatt	Timk.	18	430		2	1 1/2-3 1/2	2 1/2	S. G.			33
1050	34	K	1 1/4-King.	Own	King.	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	14 1/2	1050	3916	2	2 1/4-3 1/2	2 1/4	S. G.	In.	No	34
900	35	K	1 1/2-King.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	16	900	3762	2	2 1/4-3 1/2	2 1/4	S. G.	In.	No	35
850	36	K	2-King.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt Timk.	Timk.	Hyatt	16 1/2	850	3669	2	1.2-3.2	2.2	S. G.	In.	No	36
	37																				37	
1265	38	G-K-D	1 1/4-King.	Own		Own	Own	Sl. G.	McCord				8	1265	2500	1	1-3 1/2	3	I. G.			38
750	39	G-K	1 1/2-Ben.	Ben.	Dixie	Own	Own	Sl. G.	Own	Opt.	Own	Own	14	750	2750	2	2-3	3	Worm			39
1050	40	G	1 1/4-King.	R. W.	Split.	Delt.	Own	Sel.	Own	Gurney	Timk.	Timk.	12	710	2600	3	1 1/4-6	2 1/2	B. G.	In.	Yes	40
1050	41	G	1 1/4-King.	R. W.	Split.	Delt.	Own	Sel.	Own	Gurney	Timk.	Timk.	12	710	2600	3	1 1/4-6	2 1/2	B. G.	In.	Yes	41
1050	42	G-K-D	1 1/4-King.	Ben.	Dixie	Own	Own	Sel.	Perfex	Hyatt (N. D.)	Own	Own	10	1000	2600	2	2-3	2	I. G.		Yes	42
	43																				43	
750	44	G-K-D	2 -King.	Ben.	Dixie	Own	Own	Sel.	C. & P.	Own	Own	Own	15	800	2950	3	2-5 1/2	2	I. G.		No	44
800	45	K	1 1/2-King.	Own	King.	Own	Own	Sel.	Eureka	Own	Own	Own	14	800	2800	2	2 1/4-3 1/2	2 1/4	I. G.	Op.		45
800	46	K	1 1/2-Strom.	Ben.	Dixie	B. & B.	Own	Sel.	Own.	Opt.	Hyatt	Hyatt	14	800	2900		3 1/2	3 1/2	I. G.	In.		46
750	47	K-D	1 1/4-King.	Ben.	K-W	Own	Own	Sel.	Eureka	Own	Own	Own	14	750	2700	2	1.8-2 1/2	1.8	Ch.	Op.		47
750	48	G-K-D	1 1/2-Holl.	Ben.	Dixie	Own	Own	Sel.	Eureka	Own	Own	Own	14	750	2700	2	1.8-2 1/2	1.8	Ch.	Op.		48
900	49	G	1 1/2-King.	Donald.	Bosch	B. & B.	Cotta	Sl. G.	Eureka	S.K.F.	Hyatt	Hyatt				3	1-5	3	Ch.			49
800	50	K	1 1/2-Strom.	Ben.	Dixie	Own	Own	C. M.	Hooven	Hyatt	Hyatt	Hyatt	14	800	2600	2	2 1/2-4	2 1/2		In.		50
450	51	G-K		Own	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	20	450	2350	2-3	1 1/2	2	G.		Yes	51
450	52	G-K		Own	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	24	450	2827	2-3	1 1/2	2	G.		Yes	52
800	53	K	1 1/2-King.	Ben.	King.	Own	Own	Sl. G.	Perfex	Hyatt			13 1/2	800	2500	3	1 1/2-3 1/4	2 1/2	B. G.			53
850	54	K	1 1/2-Ben.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Own	Own	Own	12	800	2225	3			B. G.	Op.	Yes	54
900	55	K	1 1/2-Strom.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Hyatt			12	900	2800	2	2.01-2.78		I. G.	In.	No	55
750	56	K	1 1/2-Ben.	Ben.	K-W	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	16	597	2500	2	1.81-2.33		G.	Op.	No	56
500	57	K	2 1/2-King.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Hyatt	Own	Hyatt	22	500	2880	1	1 1/2-3.75		G.	Op.		57
1250	58	G-K-D	1 -Zen.	Own	Dixie	Own	Own	C. M.	Modine	Timk.	Timk.	Timk.	8	1250	2600	1	3/4-3	2 1/2	S. G.			58
1000	59	K	-Own	Own	Own	Own	Own	C. M.	Own	Gurney (S. R. B.)	Timk.	Gurney (S. R. B.)	9 1/2	1000	2480	3	1-8	2 3/4	Worm	In.		59
	60																				60	
850	61	K	1 1/2-King.	Ben.	Dixie	B. & B.	Cotta	Ind. Cl.	Spirex	Timk.	Timk.	Timk.	14	650	2275	3	3/4-4	2 1/2	F. Bevel R. Worm		No	61
	62																				62	
1000	63	G-K	1 1/2-Ben.	Own	Dixie	B. & B.	Own	Sl. G.	Long	N. D.	Timk.	Timk.	10	1000	2618	3	2-3-4	3	G.	In.		63
900-1000	64	K	-King.	Ben.	King.	Own	Nutt.	S.	Perfex	Hyatt	Own	Own	13	900	3060	2	2.3-3.8	2 1/2	S. G.		Yes	64
900-1000	65	K	-Ben.	Ben.	Dixie	Cwn	Nutt.	S.	Perfex	Hyatt	Own											

Abbreviations: Traction—Wh., wheel; Cr., crawler. Engine—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. Cylinders—Ver., Vertical; Hor., horizontal; Opp., opposed. Fuel—G., gasoline; K., kerosene; D., distillate. Carburetor—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Til., Tillotson; Zen., Zenith; Car. Carter. Air-Cleaner—Donal., Donaldson; Ben., Bennett; Hol., Holley. Magneto—A-K Atwater-Kent; Sum., Sumter; Eise., Eiseeman; Berl., Berling. Clutch—B. & B. Borg & Beck; Bier, Bierman; Mun., Muncie; Rock., Rockwood; spec., special. Gearset—B. & S. Brown & Sharpe; Nutt., Nuttall. Gearset type—Sl. G. sliding gear; Sel. G. selective gear; Fr. friction. Plan., planetary; Sl. J. C. sliding jaw clutch. Final Drive—S. G. spur gear; Ch. chain; D. R. double reduction; B. G. bull gear. Drive—Op. open; In. inclosed.

# Motor Age Monthly Guide to Tractors

Line No.	Manufacturer	Tractor and Model	Drawbar horsepower	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal H. P. M.
75	Huber Mfg. Co., Marion, Ohio.....	Huber, 12-25.....	12	25	3	24 x 42	2400	5000	.....	Wh.	60	Wauk.	4 Ver.	4½ x 5¼	1000
76	Illinois Tractor Co., Bloomington, Ill.....	Illinois, C.....	18	30	4	24 x 28	3500	5200	2,375	Wh.	54	Clim.	4 Ver.	5 x 6½	800
77		International.....	8	16	2	.....	1350	3600	.....	Wh.	40	Own	4 Ver.	4½ x 5	1000
78	International Harvester Co., Chicago.....	Titan.....	10	20	3	.....	1800	5710	.....	Wh.	54	Own	2 Hor.	6½ x 8	575
79		International.....	15	30	4	.....	2500	8990	.....	Wh.	66	Own	4 Hor.	5½ x 8	575
80	J. T. Tractor Co., Cleveland, Ohio.....	J. T., N.....	16	40	3	30	3200	6500	2,800	Cr.	.....	Chief	4 Ver.	4½ x 6	1000
81	Kardell Trac. & Tr. Co., St. Louis, Mo.....	Kardell Utility.....	10	20	2	.....	.....	3500	.....	.....	.....	Wis.	4 Ver.	4 x 5	.....
82	Keck Gonnerman Co., Mt. Vernon, Ind.....	Keck-Gonnerman, B.....	12	24	3	24 x 40	2500	6500	1,500	Wh.	60	Own	2 Hor.	7¼ x 8	700
83		Flour City, Jr.....	14	24	3	24	.....	.....	.....	.....	60	Own	4 Ver.	5 x 5	800
84	Kinnard & Sons Mfg. Co., Minneapolis, Minn.....	Flour City.....	20	35	4-5	28	.....	10000	.....	.....	72	Own	4 Ver.	5¼ x 6	800
85		Flour City.....	30	50	6-8	30	.....	14000	.....	.....	84	Own	4 Ver.	6¼ x 7	550-600
86		Flour City.....	40	70	8-10	36	.....	21000	.....	.....	96	Own	4 Ver.	7½ x 9	450-500
87	La Crosse Trac. Co., La Crosse, Wis.....	La Crosse, G.....	12	24	3	22	2000	4000	875	Wh.	56	Own	2 Hor.	6 x 7	750
88	Lauson, John, Mfg. Co., New Holstein, Wis.....	Full Jewel.....	15	30	3-4	24 x 30	3000	6500	2,150	Wh.	54	Beav.	4 Ver.	4¾ x 6	950
89	Liberty Tractor Co., Minneapolis, Minn.....	Liberty.....	18	32	4	30	3380	5900	2,475	Wh.	48	Clim.	4 Ver.	5 x 6½	850
90	Magnet Tractor Co., Minneapolis, Minn.....	Magnet, B-14-28.....	14	28	3	24	2600	4500	1,850	Wh.	48	Wauk.	4 Ver.	4½ x 6¼	900
91		Twin City, 12-20.....	12	20	3	20 x 24	2000	4200	.....	Wh.	50	Own	4 Ver.	4½ x 6	1000
92		Twin City, 16-30.....	16	30	4	24 x 28	3000	7800	.....	Wh.	54	Own	4 Ver.	5 x 7½	650
93	Minneapolis Steel & Machinery Co., Minneapolis, Minn.....	Twin City, 25-45.....	25	45	6	32 x 34	6700	16000	.....	Wh.	76	Own	4 Ver.	6¼ x 8	600
94		Twin City, 40-65.....	40	65	8	40	7500	23700	.....	Wh.	84	Own	4 Ver.	7¼ x 9	535
95		Twin City, 60-90.....	60	90	12	40	11250	2800	.....	Wh.	84	Own	6 Ver.	7¼ x 9	535
96	Mobile Tractor Co., Mobile, Ala.....	Mobile.....	12	24	.....	.....	3200	3200	1,450	.....	.....	Herc.	4 Ver.	4¼ x 5½	.....
97	Moline Plow Co., Moline, Ill.....	Universal D.....	9	18	2	22	2100	3380	1,500	Wh.	52	Own	4 Ver.	3½ x 5	1650
98	Nichols & Shepard Co., Battle Creek, Mich.....	Oil-Gas, 25-50.....	25	50	6	25-32x52	.....	19000	.....	Wh.	28	Own	2 Hor.	9 x 12	350-425
99		Oil-Gas, 35-70.....	35	70	8-10	52 x 64	.....	30000	.....	Wh.	32	Own	2 Hor.	10½ x 4	300-375
100	Parrett Tractor Co., Chicago Heights, Ill.....	Parrett, H.....	12	25	3	.....	2800	5225	.....	Wh.	60	Buda	4 Ver.	4¼ x 5½	1000
101	Peoria Tractor Corp., Peoria, Ill.....	Peoria, J.....	12	25	3	26	3000	5100	1,985	Wh.	56	Clim.	4 Ver.	5 x 6½	800
102	Pioneer Tractor Co., Winona, Minn.....	Pioneer, 18-36.....	18	36	4	28	4000	6100	.....	.....	60	Own	4 Ver.	5½ x 6	750
103		Pioneer, 30.....	30	60	10	36	8000	24000	.....	.....	96	Own	4 Ver.	7 x 8	650
104	Plow Man Tractor Co., Waterloo, Ia.....	Plow Man, 15-30.....	15	30	3-4	30	3000	5100	1,895	Wh.	60	Buda	4 Ver.	4½ x 6	1000
105	Pope Mfg. Co., Watertown, S. D.....	Dakota, 4.....	15	27	3	24	2000	5700	1,750	Wh.	42	Doman	4 Ver.	4¾ x 6	800
106	Post Traction Co., Cleveland.....	Post, D.....	12	20	2	.....	4300	.....	.....	Wh.	32	Wauk.	4 Ver.	4¼ x 5¾	800
107	Pt. Huron Eng. & T. Co., Pt. Huron, Mich.....	Port Huron, 12-25.....	12	25	3	22 x 38	2200	5900	.....	Wh.	56	Chief	4 Ver.	4¾ x 6	900
108															
109	Reed Fdy. & Mach. Co., Kalamazoo, Mich.....	One-Man.....	12	25	3	22 x 24	.....	5000	1,685	Wh.	60	Wauk.	4 Ver.	4½ x 5¾	1000
110	Rock Island Plow Co., Rock Island, Ill.....	Heider, D.....	9	16	2	20	1500	4000	.....	Wh.	54	Wauk.	4 Ver.	4¼ x 5¾	1000
111		Heider, C.....	12	20	2	24	2000	6000	.....	Wh.	57	Wauk.	4 Ver.	4¼ x 6¾	900
112		Russell Junior.....	12	24	2	18	2000	6200	.....	Wh.	53	Wauk.	4 Ver.	4½ x 5¾	1000
113	Russell & Co., Massillon, Ohio.....	Russell Little Boss.....	15	30	3	24	3000	6900	.....	Wh.	53	Wauk.	4 Ver.	4½ x 6¾	950
114		Russell Big Boss.....	20	35	4	30	4000	7600	.....	Wh.	60	Model	4 Ver.	5½ x 7	825
115		Russell Giant.....	30	60	8	40	8	24000	.....	Wh.	84	Own	4 Ver.	8 x 10	525
116	Shelby Trac. & Tr. Co., Shelby, Ohio.....	Shelby, C.....	9	18	2	22	.....	3500	.....	Wh.	42	Wauk.	4 Ver.	3¾ x 5¼	1000
117	Short Turn Tractor Co., Minneapolis, Minn.....	Short Turn, D.....	20	40	3	24	.....	5000	1,500	Wh.	65	.....	4 Ver.	4¾ x 6	950
118															
119															
120	Square Turn Tractor Co., Norfolk, Nebr.....	Square Turn, A.....	18	35	3	28	3200	7400	1,875	.....	60	Clim.	4 Ver.	5 x 6½	850
121	Stinson Trac. Co., Superior, Wis.....	Stinson, 4-E.....	18	36	4	28 x 30	.....	7100	.....	Wh.	60	Beav.	4 Ver.	4¾ x 6	950
122	Tioga Mfg. Co., Philadelphia, Pa.....	Tioga, 3.....	15	27	3-4	.....	.....	4950	.....	Wh.	36	Wis.	4 Ver.	4½ x 6	1000
123	Topp-Stewart Trac. Co., Clintonville, Wis.....	Topp-Stewart, B.....	20	35	3-5	.....	5000	7500	3,000	Wh.	42	Wauk.	4 Ver.	4¾ x 6¾	900
124	Traylor Engrg. & Mfg. Co., Cornwells, Pa.....	Traylor, 6-12.....	12	1	.....	.....	1700	750	.....	Wh.	38	Le Roi	4 Ver.	3½ x 4½	900
125	Turner Mfg. Co., Pt. Washington, Wis.....	Simplicity.....	14	25	3	24	2600	4300	1,540	Wh.	54	Buda	4 Ver.	4¼ x 5½	1000
126	U. S. Trac. & Machy. Co., Menasha, Wis.....	Uncle Sam, B-19.....	20	30	3	28	3000	4250	.....	.....	50	Beav.	4 Ver.	4¾ x 6	900
127	Victory Tractor Co., Greensburg, Ind.....	Victory, 9-18.....	9	18	2	20	1500	3300	1,385	Wh.	48	Gray	4 Ver.	3½ x 5	1000
128		Victory, 15-30.....	15	30	3	28	2500	3450	1,750	Wh.	48	Wauk.	4 Hor.	4¼ x 5¾	900
129	Vim Tractor Co., Schleisingsville, Wis.....	Vim.....	10	20	2	20	1800	3200	1,485	Wh.	48	Wauk.	4 Ver.	3¾ x 5¼	1000
130	Waterloo Gasoline Eng. Co., Waterloo, Ia.....	Waterloo Boy, N.....	12	25	3	.....	2000	5900	.....	Wh.	52	Own	2 Hor.	6½ x 7	750
131	Wetmore, H. A., Sioux City, Ia.....	Wetmore.....	12	25	2	22	.....	2900	1,485	Wh.	46	Wauk.	4 Ver.	4 x 5¾	980
132	Wisconsin Farm Trac. Co., Sauk City, Wis.....	Wisconsin, E.....	16	30	3-4	28	3500	5440	.....	Wh.	52	Clim.	4 Ver.	5 x 6½	800
133	Yuba Mfg. Co., Marysville, Calif.....	Ball Thread.....	12	20	3	.....	3500	6750	2,945	Cr.	.....	Wauk.	4 Ver.	4½ x 6¾	700
134		Ball Thread.....	20	35	5-6	.....	6000	10100	4,625	Cr.	.....	Wis.	4 Ver.	5¼ x 7	700

## One and Two-Horse Tractors

135	Allis Chalmers Mfg. Co., Milwaukee, Wis.....	General Purpose.....	6	12	1-16	.....	1000	2500	795	Wh.	48	Le Roi	4 Ver.	3½ x 4½	1000
136	Atlantic Mch. Mfg. Co., Cleveland, Ohio.....	Merry Garden.....	.....	2	.....	.....	.....	250	195	.....	20	.....	1 Ver.	2½ x 2½	900
137	Avery Co., Peoria, Ill.....	Avery, 5-10 B.....	5	10	2	22 x 32	800	2600	.....	Wh.	38	Own	4 Ver.	3 x 4	1200
138		Avery, 6-cyl.....	7	12	.....	22 x 32	.....	3150	.....	Wh.	38	Own	6 Ver.	3 x 4	1200
139	Beeman Tractor Co., Minneapolis, Minn.....	Beeman, G.....	2	4	1-7	.....	260	550	310	Wh.	25	Own	1 Ver.	3½ x 4½	850
140	Elderfield Mechanics Co., Pt. Washington, N. Y.....	Universal, 20.....	1	4	1	.....	250	750	450	.....	36	Own	1 Ver.	3½ x 5	1000
141	Indiana Silo Co., Anderson, Ind.....	Indiana.....	5	10	1	.....	900	2000	.....	Wh.	50	Le Roi	4 Ver.	3½ x 4½	950
142	La Crosse Trac. Co., La Crosse, Wis.....	La Crosse, M.....	7	12	1-16	18	1000	2600	750	Wh.	48	Own	2 Hor.	4 x 6	1000
143	Market Garden Trac. Co., Minneapolis, Minn.....	Market.....	2	4½	1-7	.....	550	.....	.....	.....	24	Veer.	1 Hor.	4 x 4	850
144	Midwest Engine Co., Indianapolis, Ind.....	Utilitor.....	2	4	1	.....	150-200	750	845	Wh.	24½	Own	1 Ver.	3½ x 4½	1200

Abbreviations: Traction—Wh., wheel; Cr., crawler. Engine—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth; Cylin., Vertical; Hor., horizontal; Opp., opposed. Fuel—G., gasoline; K., kerosene; D., distillate. Carburetor—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Tid., Tilton; Zen., Zenith; Car., Carter. Air-Cleaner—Donal., Donaldson; Ben., Bennett; Hol., Holley. Magneto—A-K, Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. Clutch—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. Gearset—B. & S., Brown & Sharpe; Nutt., Nuttall. Gearset type—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. Final Drive—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. Drive—Op., open; In., inclosed.



# and Their Technical Specifications

Normal  
H. P. M.

Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
75	G-K	1/4-King.	Ben.	King.	Own	Own	Sel.	Perfex	G. & H.	Own	Own	13	1000	2	2	2.43-3.75	2.43	S. G.	Op.	Yes	75
76	K	1 1/2-Strom.	Ben.	Dixie	Twin	Footo	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	14	600	2400	2	2 1/2-3.4	2 1/2	S. G.	In.	Yes	76
77	G-K-D	-Ens.	Ben.	Dixie	Own	Footo	Sl. G.	R. & L.	Own	Own	Own	12 1/4	625			1 3/4-4.1	3 3/4	Ch.			77
78	G-K-D	-Own	Ben.	K-W	Own	Footo	Sl. G.	Own	Own	Own	Own	18	575			2 1/4-2 3/8	2 3/8	Ch.			78
79	G-K-D	-Own	Ben.	K-W	Own	Footo	Sl. G.	Own	Own	Own	Own	18	575			2 1/4-2 3/8	2 3/8	Ch.			79
80	K	1 1/2-Own	Ben.	K-W	Own	Covert	Sel.	McCord	Timk.	Hyatt	Hyatt	10	1000	2600	3	1 1/4-5	2 1/2	I. G.	In.	No	80
81	G	1 -Carter	Ben.	Dixie	Own	Footo	Sel.	Eureka				800			2						81
82	K	-Scheb.	Ben.	Bosch	Own	Own	Sl. G.	Own				11 1/2	700		3	2 1/2-3 1/2	3	S. G.			82
83	G-K	1 1/2-Scheb.	Ben.	K-W	Own	Own	Sl. G.	Long	Hyatt			26	320		2	2 1/4-3 1/2	2 1/4	G.			83
84	G-K	1 1/2-Scheb.	Ben.	K-W	Own	Own	Sel.	Modine				26	350		2	2 1/4-3	2 1/4	G.			84
85	G-K	2 -Scheb.	Ben.	K-W	Own	Own	Sl. G.	Modine				32	275		1		2 1/2	G.			85
86	G-K	2 1/2-Scheb.	Ben.	K-W	Own	Own	Sl. G.	Modine				34	275		1		2 1/2	G.			86
87	K	1 1/2-King.	Ben.	Dixie	Own	Own	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	7x11	750	2125	1	2-2 3/4	2 1/2			Yes	87
88	K	1 1/2-King.	Ben.	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Timk.	Hyatt	18	475	2200	2	1 1/2-2 1/2	2 1/2	G.	In.		88
89	G-K	1 1/2-Strom.	Ben.	Dixie	Bier.	Own	Sl. G.	S-J	Hyatt	Own	Own	12	900	2825	2	2 1/4-5	2 1/4	S. G.	In.	Yes	89
90	G-K	1 1/2-Strom.	Ben.	Berl.	B. & B.	Own	Sl. G.	S-J	N. D.	N. D.	Opt.	14	700	2600	3	1 1/4-8	2 3/4	Worm		Yes	90
91	G-K	1 1/2-Holl.	Ben.	Bosch	B. & B.	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	16	650	2700	2	2.2-2.9	2.9	S. G.	In.	Yes	91
92	G-K	1 1/2-Holl.	Ben.	K-W	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	17	528	2350	2	2-2.75	2 3/4	S. G.	In.		92
93	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	20	600	3150	2	1.4-2	2	S. G.	Op.		93
94	G-K	2 1/2-King.	Ben.	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	23	535	200	1	2	2	G.	Op.		94
95	G-K	3 -King.	Ben.	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	23	535	3200	1	2	2	S.	Op.		95
96	K	-King.	Ben.	Eise.	B. & B.	Spec.	Own	Opt.	Opt.	Opt.	Opt.	8x12									96
97	G	1 1/2-Holl.	Ben.	Remy	B. & B.	Own	Sl. G.	Modine	Hyatt		Hyatt	9		2600	1	1 1/2-3 1/2	3 1/4	G.	In.	Yes	97
98	K	2 1/2-King.	Ben.	Wico.	Own	Own	Sl. G.	Perfex	Own	Own	Own	9x24			1	2-2.42	2-2.42	S. G.			98
99	K	3 -King.	Ben.	Wico.	Own	Own	Sl. G.	Perfex	Own	Own	Own	12x30			1	1.86	1.86	S. G.			99
100	K	1 1/2-King.	Ben.	Eise.	Own	Own	Sl. G.	Perfex	Hyatt	Hyatt	Hyatt	12	1000	3141	3	1.80-4		I. G.	In.		100
101	K	1 1/2-Strom.	Ben.	Eise.	Own	Nutt.	Sl. G.	Eureka	Hyatt			14	650	2500	2	2 1/4-4	2 1/2	I. G.		Yes	101
102	G-K	1 1/2-King.	Ben.	K-W	Own	Own	Sl. G.	S-J	Timk.	Timk.	Timk.	14	750		3	1 1/4-4	2 1/2	S. G.			102
103	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	S-J	Own	Own	Own	17 1/2	650		3	1 3/4-4 1/4	2 1/2				103
104	G-K	1 1/2-Strom.	Ben.	Dixie	Twin	Footo	Sl. G.	Perfex	Hyatt	Hyatt	Hyatt	14	500	2200	2	2-3		I. G.	Op.		104
105	K	1 1/2-Linga	John.	K-W	Bier.	Own	Sl. G.	S-J	Own	Own	Own	14	800	2500	1	3	3	Ch.		Yes	105
106	G-K	-King.	Ben.	Split.	Own	Own	Sl. G.	Perfex	Opt.	Timk.	Timk.	14	2500		2	3-3	3	G.		Yes	106
107	G-K	1 1/2-King.	Ben.	King.	Own	Own	Sl. G.	Bremer	S. K. F.	Plain	Plain	14	650-1065	2380-3900	7	1 1/2-4	2	S. G.	In.	Yes	107
108	G-K	1 1/2-King.	Ben.	Dixie	Bier.	Own	Sl. G.	Modine	Hyatt		Hyatt	14 1/2	2600	703	2 1/2-3 1/2		2 1/2	B. G.	In.	Yes	108
109	G-K	1 -King.	Ben.	Dixie	Own	Own	Fr.	Perfex	U. S.	Own	Own	12	700	2200	7	2-5	1 1/4	B. G.	Op.	Yes	109
110	G-K	1 -King.	Ben.	Dixie	Own	Own	Fr.	Perfex	U. S.	Own	Own	14	600	2200	7	2-4	2 1/4	B. G.	Op.	Yes	110
111	K	1 1/2-King.	Ben.	Bosch	Own	Cotta	Sl. G.					12 1/2	915	3000	3	1 1/2-3 1/2	2 1/4	S. G.	Op.		111
112	K	1 1/2-King.	Ben.	Dixie	Own	Cotta	Sl. G.					12 1/2	810	2850	3	1 1/2-3 1/2	2 1/4	S. G.	Op.		112
113	K	1 1/2-King.	Ben.	Dixie	Own	Own	Sl. G.					12 1/2	840	2749	2	2.4-3 1/4	2.4	S. G.	Op.		113
114	K	2 -King.	Ben.	Bosch	Own	Own	Sl. G.					24	525	3310	2	2-4 1/2	2	S. G.	Op.		114
115	G	1 -King.	Ben.	Dixie	Full.	Full.	Sl. G.	Modine	Timk.	Timk.	Timk.	10	850	2200	3	1 1/4-4 1/4		I. G.	In.		115
116	G-K	1 1/2-Opt.	Opt.	Dixie	Own	Own	Sel.	Splitex	Own	Own	Own	18	950		2	2-3	2 1/2-3	I. G.		Yes	116
117	G-K	1 1/2-Opt.	Opt.	Dixie	Own	Own	Sel.	Splitex	Own	Own	Own	18	950		2	2-3	2 1/2-3	I. G.		Yes	117
118	G-K	1 1/2-Opt.	Opt.	Dixie	Own	Own	Sel.	Splitex	Own	Own	Own	18	950		2	2-3	2 1/2-3	I. G.		Yes	118
119	G-K	1 1/2-Opt.	Opt.	Dixie	Own	Own	Sel.	Splitex	Own	Own	Own	18	950		2	2-3	2 1/2-3	I. G.		Yes	119
120	G-K	1 1/2-Strom.	Ben.	Dixie	Own	Own	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	12	850	2669	1	2 1/2	2 1/2	I. G.		Yes	120
121	K	1 1/2-King.	Ben.	Dixie	Own	Own	Sl. G.	Todd	Hyatt	Hyatt	Own	12	950	2985	1	2 1/2-3	3	S. G.	In.	Yes	121
122	G	1 1/2-Strom.	Ben.	Split.	Twin	Own	Sel.	G. & O.	Gurney	Timk.	Opt.	12			2	2.7-3.7	2.7	G.	In.	No	122
123	G	1 1/2-Strom.	Ben.	Eise.	B. & B.	Own	Sel.	Bremer	Hyatt	N. D.	N. D.	12	900	2600	3	1 1/4-4 1/2	2 1/2	I. G.			123
124	G	-King.	Ben.	Dixie	B. & B.	Own	Sl. G.	G. & O.				8		1000	1	3 1/2-5	3 1/2	B. G.			124
125	G-K	1 1/2-King.	Ben.	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	14	600	600	2-2 1/2	1 1/4-3	2 1/2			Yes	125
126	K	1 1/2-Ben.	Ben.	Dixie	Twin	Nutt.	Sl. G.	Perfex	Timk.	Timk.	Timk.	11	900	2600	2.6-3.8	2-4	2.6	S. G.	In.	Yes	126
127	G	1 -Car.	Ben.	Berl.	B. & B.	Own	Sl. G.	James.	Schatz	Hyatt	Opt.	10	820	2650	2	1 1/4-4 1/4	2 1/2	S. G.			127
128	G	1 1/2-Ben.	Ben.	Berl.	B. & B.	Own	Sl. G.	James.	Schatz	Hyatt	Opt.	10	800	2600	2	1 1/4-4	2 1/2	S. G.			128
129	G-K	-Ben.	Ben.	Simms	B. & B.	Own	Sl. G.		Gurney	Hyatt	Hyatt	9	1000	2300	2	2 1/2-5	2 1/2	I. G.		Yes	129
130	K	1 1/2-Scheb.	Ben.	Dixie	Own	Own	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	14	750	2750	2 1/2-3	2 1/4-3	2 1/4-3	I. G.	Op.	Yes	130
131	G	1 1/2-King.	Ben.	Dixie	Full.	Full.	S. G.	Ideal			Timk.	12	900		3	2-5	3	I. G.	In.	Yes	131
132	K	1 1/2-Strom.	Ben.	Eise.	B. & B.	Footo	S. G.	Perfex	Hyatt			16	600	2600	2	1 1/2-4	2 1/2	S. G.			132
133	D	1 1/4-Ens.	Donald.	Bosch	B. & B.	Own	S. G.	Own	Hyatt		Hyatt	12	700	2200	3	1.5-4	2.08	B. P.			133
134	D	-Strom.	Donald.	Bosch	Para.	Own	S. G.	Own	Hyatt		Hyatt	10-14	700	1835	2	2.06-3.28	2.06	I. G.			134

## One and Two-Horse Tractors

135	G	½-King.	Ben.		B. & B.	Own	Sl. G.	Own	Gurney	Own	Own	10	1000	2600	1	1½-2.4	2.4			Yes	135
136	G			Evin.	Own	Own	Sl. G.		Own		Own	6	200		1	1¼-2¼		S. G.			136
137	G-K	¾-King.		K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1½-4¼	2½	S. G.	Op.		137
138	G-K	¾-King.		K-W	Own	Own	Sl. G.	Own		Own	Hyatt	12	780	2450	3	1½-4¼	2½	S. G.	Op.		138
139	G	¾-King.	Donald.	Heinze	Own	Own		S-J		None	None	4½	850	900	1	¾-3	2	G.		Yes	139
140	G	¾-Zen.		A-K	Own	Own		Main				6	1000		1	1-3	2	Worm			140
141	K	¾-King.	Ben.	A-K	Own	Own	Sl. G.	Cand.					1200		1¼-4			Ch.	Op.		141
142	K	1¼-King.	Ben.		Own	Own	Own	Hopper		Own	Own	10	1000	2600	1	1¾-2½	2½			Yes	142
143	G	1½-Verac.	Ben.	Berl.	Own	Own	Spec.			Timk.		6	2000		1	1½-2½	2½	Worm			143
144	G	¾-King.	Own	Eise	Own	Own		Modine	Fafnir			4½	1200	1200	1	2½	2½	J. G.	In.		144

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# Motor Age Monthly Guide to Tractors

Line Number	Manufacturer	Tractor and Model	Drawbar horsepower	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. P. M.
145	New Britain Mch. Co., New Britain, Conn.	New Britain, 1.	3	6	1-8		400	650	400	Wh.	26½	Own	2 Ver.	2¾ x 4	1500
146	New Britain Mch. Co., New Britain, Conn.	New Britain, 2.	3	6	1-8		400	750	450	Wh.	32	Own	2 Ver.	2¾ x 4	1500
147	Oldsmar Tractor Co., Oldsmar, Fla.	Oldsmar.	1-3	5	1		150-450	1200	375	Wh.	32	Evin.	1 Ver.	5 x 5½	580
148	Scientific Farming Mch., Minneapolis, Minn.	Princess Pat.	12	25	2	24 x 26	2000	3500	1,750	Wh.	46	Buda	4 Ver.	4¼ x 5½	1000
149	Tillermobile Co., Minneapolis, Minn.	Tillermobile, A.	2	6	1-8			625	385	Wh.	30	Veer.	1 Ver.	4 x 4	1200
150	Toro Motor Co., Minneapolis, Minn.	Toro.	12		1		1100	2400	900	Wh.	42	Le Roi	4 Ver.	3½ x 4½	1200

## Motor Cultivators

151	Avery Co., Peoria, Ill.	Avery, C.						3450		Wh.	38	Own	4 Ver.	3 x 4	1200
152		Avery, 5-10.	5	10				3050		Wh.	38	Own	4 Ver.	3 x 4	1200
153	Bailor Plow Mfg. Co., Atchison, Kans.	Bailor, A.	6					2150	925	Wh.	44	Le Roi	4 Ver.	3½ x 4½	1000
154		Bailor, W.	6					1800	775	Wh.	40	Le Roi	4 Ver.	3½ x 4½	1000
155	Detroit Culto-Tractor Corp., Detroit, Mich.	Detroit Culto, AA.	9	16	2	20 x 28	1600	1800	775	Wh.	42	Own	2 Ver.	4 x 6	400
156	Emmerson-Brantingham Co., Rockford, Ill.	E-B.			None			3200		Wh.	42	Le Roi	4 Ver.	3½ x 4½	100
157	Rock Island Plow Co., Rock Island, Ill.	Heider, 10.	6	10	1			2700		Wh.	46	Le Roi	4 Ver.	3½ x 4½	
158	Shaw Enoch Trac. Co., Minneapolis, Minn.	Shawnee.	6	12				2600				Le Roi	4 Ver.	3½ x 4½	
159		Shawnee.	9	18				3000				Gray	4 Ver.	3½ x 5	
160	Toro Motor Co., Minneapolis, Minn.	Toro.					1100	2200		Wh.	42	Le Roi	4 Ver.	3½ x 4½	1200
161	Wilson Trac. Co., Peoria, Ill.	Wilson, J.	6	12	2			3000	800		44	Le Roi	4 Ver.	3½ x 4½	1000

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukeshia; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Chim., Climax; Twin, Twin City; Cont., Continental; Ruten, Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G., gasoline; K., kerosene; D., distillate. **Carburator**—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K., Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Bering. **Clutch**—B. & B. Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final Drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

### ADVERTISING LANDS HIM IN COURT

Los Angeles, Mar. 18.—Indications are that speed tests on the highways by motor car dealers are going to result in entanglements with the legal authorities. A few days ago it was announced that a new motor car record between San Francisco and Los Angeles had been established. Hardly had the ink dried on the advertisement announcing the fact when the county grand jury summoned the sales manager of the firm representing the car that set the record before that body. About five years ago there was a craze to set new inter-city highway records. Everybody was doing it. Vehement protests went up from the public at large against such abuse of the highways that the authorities asked for and obtained an understanding with the car dealers that they would refrain from such violations of the highway laws. Now that a revival of speed runs seems probable the authorities are demonstrating very promptly that they are on the job.

### FORD TO INVADE SPAIN

Washington, March 18.—The Ford Motor Co. has been granted authority by the Spanish government to establish an automobile assembling plant within the zone embraced in the "Free Depot" of the port of Cadiz, Spain, according to a report received from the American Consulate office at Cadiz, by the Bureau of Foreign & Domestic Commerce. The company has already shipped considerable machinery and is commencing installation and expects to start assembly in the near future.

### New York Official Criticizes Present Service of Tractors

**B**UFFALO, March 21.—The day of the exclusive farm tractor garage and service station is at hand. Progressive tractor men, far-sighted enough to enter this field and become pioneers in the tractor service field, will succeed.

These predictions were made by F. G. Behrends, director of New York state's tractor school conducted here recently. Mr. Behrends conducted the school for the state extension bureau in co-operation with the Erie County farm bureau.

Summarizing his views of the tractor service problem, Mr. Behrends said:

"I believe the time has come for the establishment of the exclusive tractor garage and service station. In 1918 we had but 2,700 tractors in operation in New York state; today there are four times that number, and by this time next year the total will have again been multiplied.

"Small towns and villages which are the centers of rich farming districts are the logical centers for the tractor service station. No one would expect a Pierce-Arrow expert to open a small town garage and exist on Pierce-Arrow service alone. To succeed he would have to give service on all types and makes of cars. The same is true of the tractor service pioneer. He will have to know enough all standard makes of machines to give efficient service on any.

"Unlike the balky automobile the trac-

tor can not be driven in a few minutes to the service station. This must be brought to it. Equipped with a light car the tractor service man could be at the side of the disabled tractor in a few minutes and the cost of such service would not be prohibitive.

"Neither would the parts problem be an especially difficult one. It will be found that in any average farm community four to six tractors will completely dominate the field. The service man who carried the more called for parts for these would seldom be caught napping when asked for replacements, and the cost of his stock would not be great.

"It might be well to specialize on service on the kind of tractor the service man was selling and it is only reasonable to expect that he would have one or more agencies. But he should be prepared and glad to give service on other makes as well.

"Tractors have come into what might be called general farm use only during the past three or four years. As yet few have needed complete overhauling. But the time is rapidly coming when a tractor service expert will be able to profitably employ all his winter hours overhauling and rebuilding tractors left with him during the months they are seldom or never used, just as the garage man of today employs his winter months rebuilding and overhauling the cars of his patrons preparatory to the Spring driving season."

The Buffalo tractor school was unusually successful, seven makes of machines being exhibited and thoroughly demonstrated to the class of 75 men for a period of five days.



# and Their Technical Specifications

Normal R. P. M.	Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
1500	145	G	3/4-King.	Ben.	Dixie	Own	Own	.....	G. & O.	Own	.....	.....	5 1/2	1500	2160	1	1-3	.....	B. G.	In.	.....	145
1500	146	G	3/4-King.	Ben.	Dixie	Own	Own	.....	G. & O.	Own	.....	.....	5 1/2	1500	2160	1	1-3	.....	B. G.	In.	.....	146
580	147	G	1 -Scheb.	Own	Opt.	Own	.....	.....	None	Own	.....	.....	5	580	240	2 1/2	.....	2 1/2	.....	.....	.....	147
1000	148	K	1/4-Ben.	Martain	Dixie	B. & B.	Own	Sl. G.	S-J	Hyatt	Hyatt	Hyatt	12	1000	3100	2	2 1/2-4 1/2	2 1/2	I. G.	In.	Yes	148
1200	149	G-K	-Verac	Own	Berl.	Own	Own	D. R.	.....	.....	.....	.....	11	.....	.....	1	1-3	2 1/2	B. G.	.....	.....	149
1200	150	G	3/4-King.	Ben.	Eise.	Own	Own	Sl. G.	B. & W.	Opt.	.....	Hyatt	8	1200	2400	2	1-3 1/2	3 1/2	B. G.	In.	.....	150

## Motor Cultivators

1200	151	G-K	3/4-King.	.....	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1 1/2-4 1/2	2 1/2	S. G.	Op.	.....	151
1200	152	G-K	3/4-King.	.....	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1 1/2-4 1/2	2 1/2	S. G.	Op.	.....	152
1000	153	G	3/4-King.	Ben.	Dixie	B. & B.	.....	.....	Perfex	.....	Hyatt	Hyatt	.....	.....	.....	2	2 1/2-3.7	.....	Ch.	.....	.....	153
1000	154	G	3/4-King.	Ben.	Dixie	B. & B.	.....	.....	Perfex	.....	Hyatt	Hyatt	.....	.....	.....	2	2 1/2-3.7	.....	Ch.	.....	.....	154
400	155	G	1 1/4-Strom.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt	Own	Own	8	885	1800	2	1-3	2 1/2	B. G.	In.	.....	155
100	156	G	-Holl.	Ben.	Dixie	Own	None	None	Perfex	Hyatt	Own	Hyatt	7 1/2	995	.....	1-5	1 1/2-3 1/2	None	.....	.....	.....	156
.....	157	G	3/4-King.	Ben.	Dixie	.....	.....	.....	Perfex	Opt.	.....	.....	.....	.....	.....	.....	1 1/2-3 1/2	.....	B. G.	Op.	.....	157
.....	158	.....	.....	.....	.....	B. & B.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	158
.....	159	.....	.....	.....	.....	B. & B.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	159
1200	160	G	3/4-King.	Ben.	E. & D.	Own	Own	Sl. G.	B. & W.	Opt.	.....	Hyatt	8x6	1200	2400	2	1 3/2	.....	B. G.	In.	.....	160
1000	161	G	3/4-King.	Own	Eise.	B. & B.	Own	Sl. G.	Modine	S. K. F.	Hyatt	Hyatt	6	1000	1570	2	1.3-3.5	.....	S. G.	In.	.....	161

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## TO BUILD NEW EMPIRE STATE TURNPIKE

Rochester, March 18—The present state highway between Albany and Buffalo is becoming so badly congested that Commissioner of Highways Frederick Stuart Greene has deemed a new route a necessity in order to accommodate increasing traffic, and has designated the Empire State Turnpike which will be about twenty-five miles shorter between the two cities than the present highway. The new route will connect the Great Lakes with the Atlantic seaboard at Boston.

The new route was designed to meet the wishes of the farmers and motorists. It passes through the fruit belt in the western part of the state, touches five of the Finger Lakes and goes through several of the populous farming towns of Madison, Oneida, Otsego and Schoharie counties.

### Greatly Aids Tourists

Through the Mohawk valley and from Syracuse to Buffalo the new road will eliminate the necessity of passing through a number of the larger cities and towns where speed laws and congested traffic hamper tourists and increase the running time.

In laying out the new heavy traffic trunk line, Commissioner Greene had in mind the problem of road maintenance without having to divert traffic. With the parallel routes between Albany and Buffalo it will be possible to repair them during alternate seasons, thus allowing one route to be open at all times.

## French Manufacturer Guarantees Overhaul Price On His Car

PARIS, March 5—A guarantee completely to overhaul its car for a cost not to exceed \$1,000 after it has been run 60,000 miles is the unusual innovation made by the Corona Automobile Company, making the Corona car, the first twelve-cylinder job ever built in France. The company also issues a five year guarantee of the car's performance. The new Corona lists at \$15,000 for the chassis.

G. Michaux, a consulting engineer who some years ago was responsible for the design of the small Peugeot racing cars, is the designer of the new Corona car. Cylinder dimensions are 3.1 by 4.7 in. bore and stroke and are cast in two sets of six, mounted at an angle of 40 deg. Valves are carried in cages at the head and are operated by means of camshafts in the basechamber, pushrods and rockers. All the valve operating mechanism is inclosed, the cover also hiding the spark plugs and the ignition wires. The crankshaft is carried in three roller bearings with a double thrust ball race at the flywheel end.

One of the features of this engine is the dry sump oiling system. All the oil is contained in a tank around the base chamber, and is delivered to the bearings under pressure. The excess from the bearings, which falls into the base chamber, is collected by a scavenging pump and returned to the oil tank. Fresh oil is poured in through a cap on the top of each cylinder casting.

In addition to this, there is a central oil tank in the dash, from which lubricant is delivered automatically to the gearbox, the rear axle, the front axle, the steering connections, shackle bolts and springs. No oil can be required on this car. Naturally there is no return from the organs fed by the accessory tank.

Unit construction of engine and gearbox has been adopted, with three speeds and reverse, center control, and either left or right hand steering. The drive shaft is inclosed, and there is a flexible metal cover around the universal behind the gearbox, allowing oil to be delivered from the gearbox to the universal, and from there to the rear axle. This latter is full floating type, specially designed for rapid dismounting of the differential housing, the crown wheel and the driving pinion. Spiral bevel gears are used.

### Brakes on All Four Wheels

Brakes are fitted on all four wheels, the drums being 16 1/2 inches in diameter and 2.3 inches in width. No brake operating rods are visible, and at the front the brake lever is passed inside the steering pivot. The stub axles are hollow, with a diameter of 2.5 inches, which is also the diameter of the rear axle.

The hubs are interchangeable front and rear, and detachable metal wheels are employed. The car has electric lighting and starting, ignition by two magnetos with automatic advance, speed indicator and revolution counter, and an engine driven tire pump.

# From the Four Winds

## Glimpses at the World of Motordom

### Coming Motor Events

#### AUTOMOBILE SHOWS

Duluth, Minn.	Automobile Show	March 22 to 27
Oklahoma City, Okla.	Oklahoma City Dealers' Ass'n	March 22 to 27
Torrington, Conn.	Automobile Show	March 22 to 27
Utica, N. Y.	Automobile Show	March 22 to 27
Columbia, S. C.	Automobile Show	March 22 to 27
Newton, Kans.	Automobile Show	March 24 to 27
Hutchinson, Kans.	Automobile Show	March 25 to 27
Goldsboro, N. C.	Goldsboro Automotive Trade Ass'n	March 31 to Apr. 3
Gloversville, N. Y.	Automobile Show	April 5 to 10
Albany, N. Y.	Automobile Show	April 6 to 10
Fort Worth, Tex.	Automobile Show	April 12 to 13
Macon, Ga.	Macon Automobile Dealers' Ass'n	May 6 to 8

#### RACES

Indianapolis Speedway	500-mile Race	May 31
Uniontown, Pa.	Speedway Race	June 12
Tacoma, Wash.	Speedway Race	July 5
Cincinnati, O.	Speedway Race	Sept. 6
Uniontown, Pa.	Speedway Race	Sept. 6

#### TOURS

Omaha, Neb.	Truck Reliability Run	June 1
Lake Huron Tour		July 4
New York-San Francisco	Glidden Tour	September

**New Pavement Maintenance Plan**—At a meeting of the Automobile Accessories Business association of Philadelphia, held in the rooms of the Philadelphia Automobile Trade association, the members passed a resolution to express to Richard Weglein, president of the Philadelphia City Council, their hearty endorsement of this plan to divide the city into sections, the streets of each section, to be kept in repair by a gang under a competent foreman. As soon as the pavement becomes damaged in any way, this gang is to repair the damage immediately. The association believes that in this way, the streets of Philadelphia will be much improved for traffic.

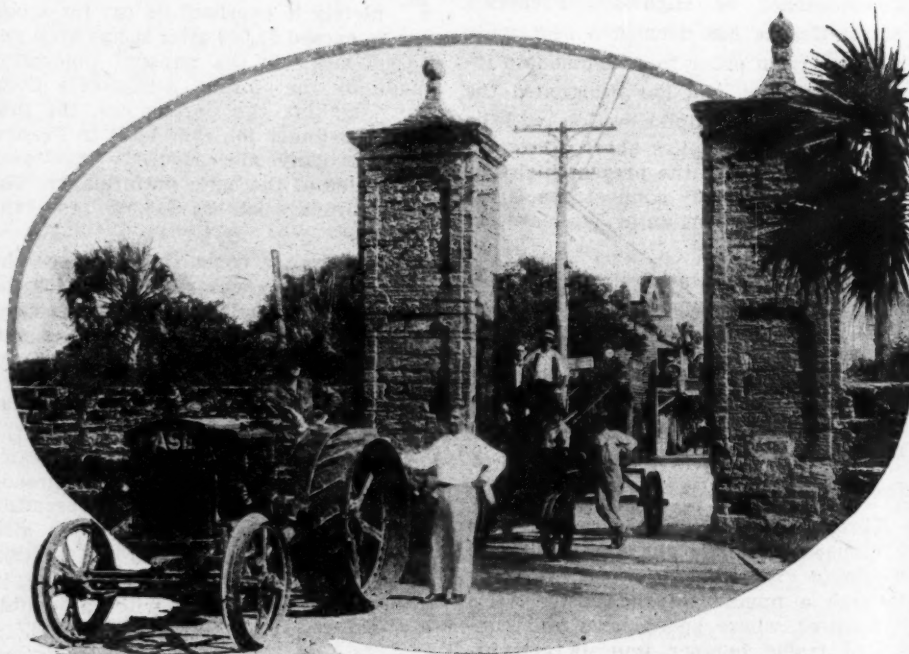
**Pennsylvania Plans Road Building**—Construction of 800 miles of durable highways in various sections of Pennsylvania is planned for 1920 by the State Highway department. Most of the new mileage is located on what is known as the primary system, or through highway routes. It is the intention of Governor Sproul and the department to complete the State's primary system as soon as possible.

**Bridge Aids Tourists**—The Pend Oreille river, in the panhandle of Idaho, is to be spanned at Metaline Falls by a modern toll bridge. The enterprise is of much interest to motor tourists. The bridge will constitute an important link in the California Banff Bee Line highway, and will give shortest access from Spokane to the British Columbia and

the Kootenai Lakes country. A link in this highway from Metaline Falls to the international boundary, 12 miles, is now under construction by the national forest at a cost of \$90,000, and this piece of work will be open about Aug. 1.

**Record Car Movements**—A requirement of the Montreal provincial motor regulations obliges all owners to register the time of their cars in and out of public garages. This register is attested by the garage man. Some owners and garage proprietors are rather negligent about following out this requirement in a diligent manner. An official of the Automobile Club, apart from the legal requirements, points out that such a regulation, carefully followed, may be of very great service to the owner at times in proving his whereabouts in the matter of alleged contraventions of the law, damage claims, etc. It is also a good practice for the owner of a private garage to keep such a book of record of the movement of the car.

### The Oldest City in the United States Uses Modern Machinery



St. Augustine, Fla., is the oldest city in the United States, but it ranks with the youngest and most progressive cities in the matter of civic pride and municipal improvements. This is proved by the vigorous way in which St. Augustine has attacked the problem of building and maintaining its streets and surrounding roads.

This shows the city's Case tractor standing by the oldest gate in the United States. The city gates shown here were built from 1702 to 1727. They are all that now remains of the elaborate lines of defense that once withstood the attacks of all enemies.